WIRE AND WIRE PRODUCTS

JANUARY 1959

Packaged Productivity in Wire!

VAUGHN® MOTOBLOX®

VAUGHN puts everything but a bow on this package for you . . . including all electrical equipment and prewired controls. Compact, self-contained, easy to install, this packaged MOTOBLOX requires no separate room or additional space for motor generator set, starter or dc control—affords the highest speeds you can use today. Write us for the details!

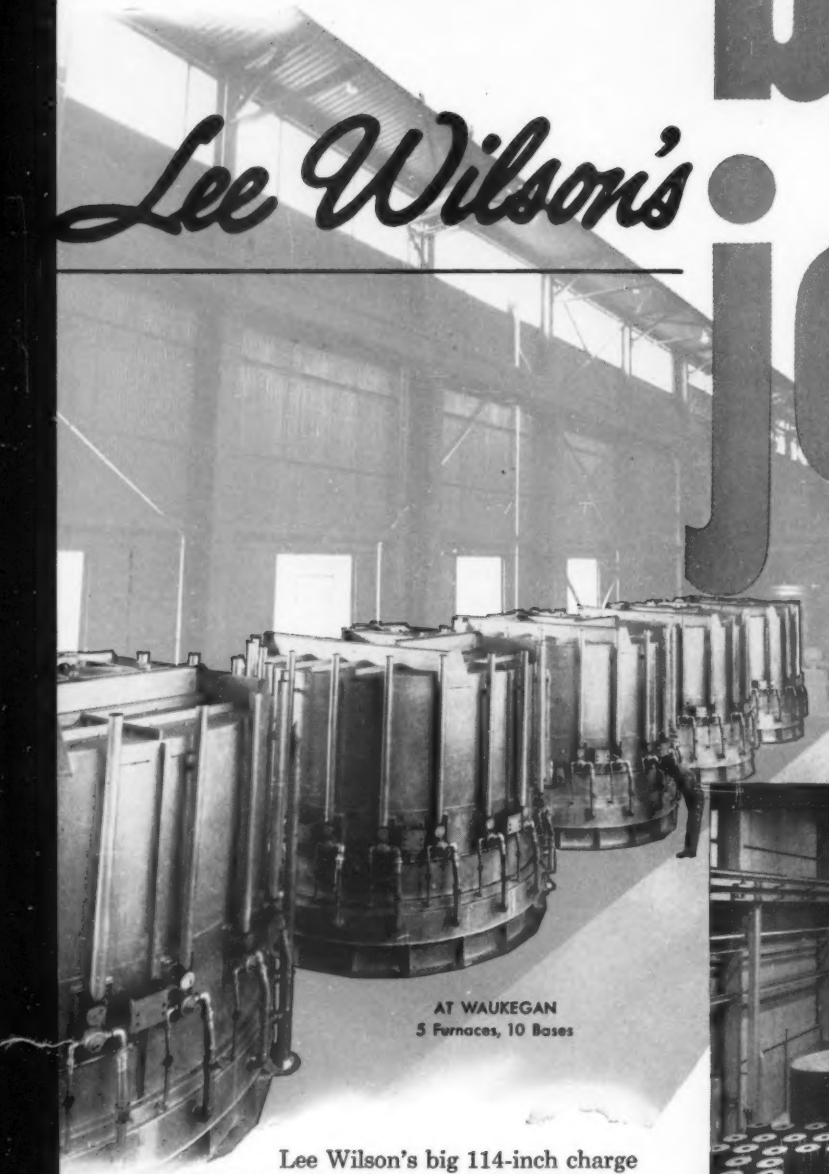
The VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Lee Wilson's 'big jobs..'

give American Steel and Wire greater productivity, better Rods and Wire



AT WAUKEGAN
5 Furnaces, 10 Bases

AT CUYAHOGA WORKS 6 Furnaces, 12 Bases

Lee Wilson's big 114-inch charge diameter rod and wire annealing furnaces give American Steel and Wire both the speed and quality they require to meet modern-day competition.

The largest furnaces of their type ever built, they will easily take four spiders of heavy rod in a single charge. A high convection system that sends 5 million BTU's per hour is controlled with exacting precision from a central control area.

If you're considering investing in new wire annealing equipment, make certain you check first with Lee Wilson—America's most experienced wire and rod annealing equipment manufacturer.

Lee Wilson* ENGINEERING COMPANY, INC.
20005 LAKE ROAD • CLEVELAND 16, OHIO

HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURN

DO YOU HAVE • • •

Difficult Drawing?

High Finishing Speeds?

Very Close Finishing Tolerances?

PSI Range of 300,000+?

High Tonnages?

America's Finest E. P. Lubricants*

Are meeting these requirements!

Finishing Speeds — in excess of 1700 FPM

Finish Sizes — +.0005" — None

Multiple Drafts — Lime Coated Rods

Pressure Die in Ripper Advantageous

Peak Tonnage

Mill Tested and Approved

"Look to Standard for the Future"

Cordially yours,

Standard Industrial

COMPOUNDS CO., INC.

Member WAS

FRANKFORT, ILLINOIS

(A suburban Chicago area city)

Telephones: 2131-2141

* Extreme Pressure Additives

Why we make so many types of screw wire

Bethlehem makes many different types of screw wire to suit each of the major groups of screws—wood, machine and tapping (sheet-metal)—which face different job requirements. And each of the many types of heads—round, flat, recessed, filister, etc.—poses different manufacturing problems.

Thus the ideal wire for a given type of fastener will differ in some way from wire made for other kinds of screws. Producing the right kind of screw wire for each specific requirement is a Bethlehem specialty. Some of this wire must have good machining properties. Some must readily respond to heat-treatment—or withstand severe cold-heading.

All of these requirements mean close control of such factors as chemical composition, heat-treatment and mechanical properties, which determine how we'll process your wire in our modern wire mills. Thorough inspection at every stage of production is but one phase of the quality-control standing behind every ton we ship.

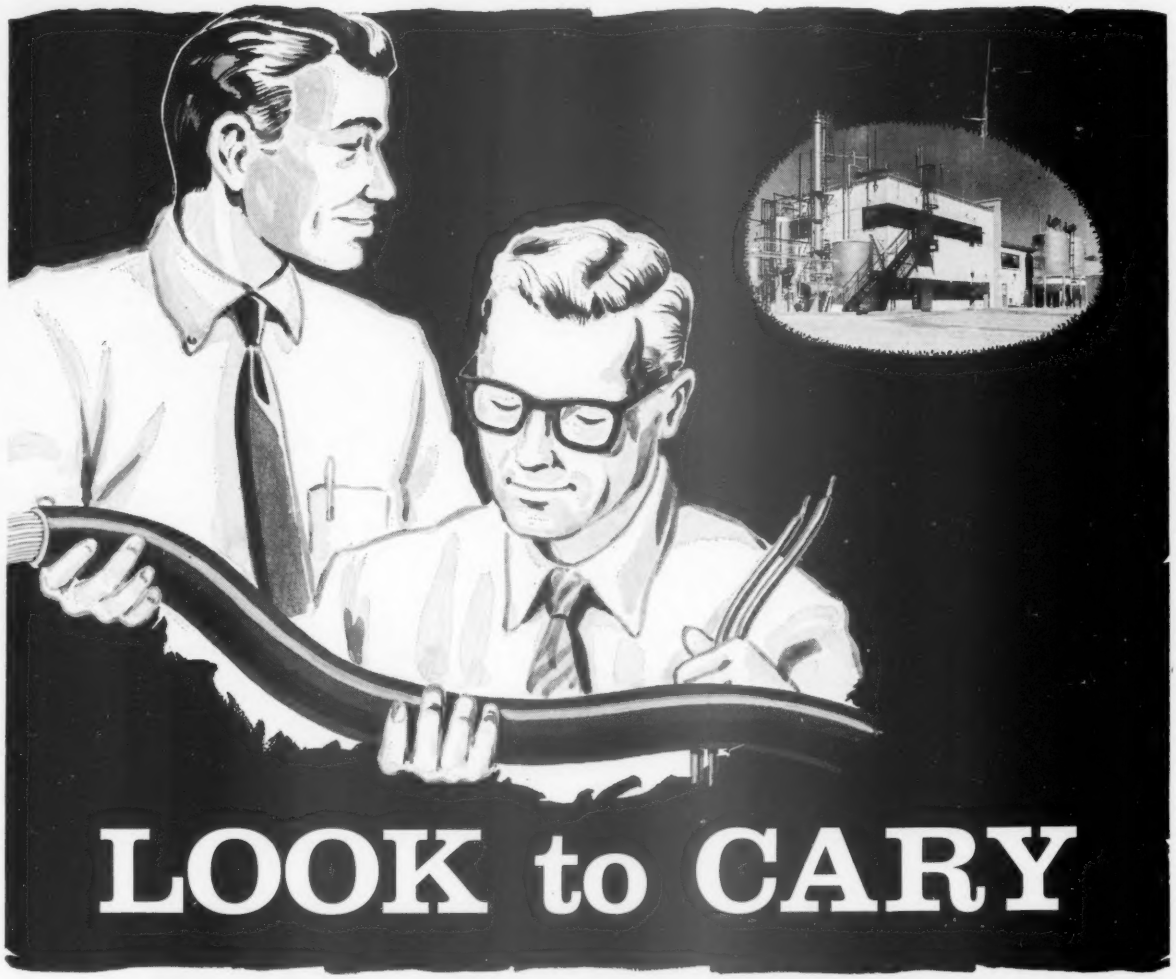
Bethlehem makes just about every kind of steel wire. Some are general purpose grades; others like screw wire, are custom-made for a specific application. In all cases you can count on Bethlehem quality and cooperation. We invite you to consult us. Just phone the nearest Bethlehem office, or drop us a line at the address below.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



LOOK to CARY

for VINYL WIRE & CABLE INSULATION COMPOUNDS & RESIN — to meet your most exacting requirements!

SPECIALISTS IN WIRE COVERING APPLICATIONS, CARY OFFERS—

UL-approved BLACAR #250 PVC RESIN—high molecular weight (completely interchangeable in recognized compounds)—with excellent dry blending characteristics and low gel count. Intermediate and low molecular weight BLACAR resins are readily available.

BLACAR PVC COMPOUNDS include *#2800 — #2700 — #2600* — all UL-approved. If you are working with type T — TW — TF and TFF wire — or concerned with any of a wide range of low-tension applications — *there is a BLACAR PVC Compound "job-engineered" to fit your specific needs.*

Cary offers compound modification — custom-formulating — technical assistance — upon request. Write for samples and data.

CARY CHEMICALS INC.

CARY CHEMICALS INC.

Mail address: P.O. BOX 1128, NEW BRUNSWICK, N. J.

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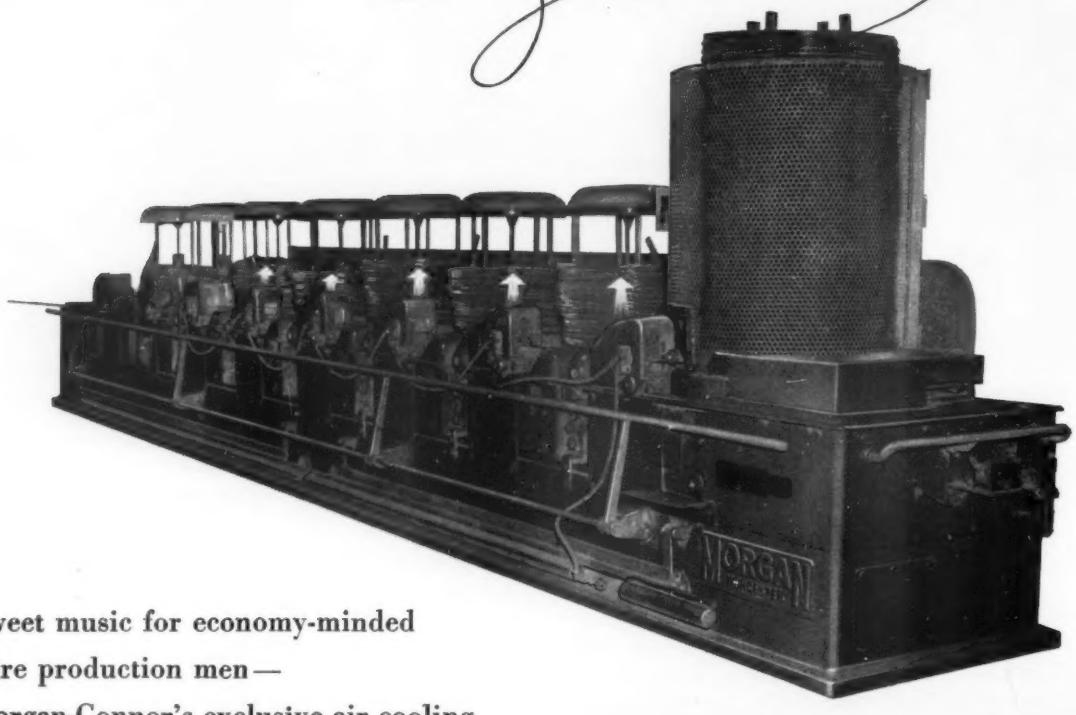
Canadian Representative: Lewis Specialties, Ltd., 18 Westminster North, Montreal 28, Que.

draw it *FAST*

draw it COOL



Sweet music for economy-minded
wire production men—
Morgan-Connor's exclusive air cooling
gives you fast drawing
and high production.
You get superior results
at low die costs
and low power costs.

MORGAN
WORCESTER

WM-104

MORGAN CONSTRUCTION COMPANY — WORCESTER, MASSACHUSETTS

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 34 January, 1959 No. 1

Designated as Official Publication By The Wire Association

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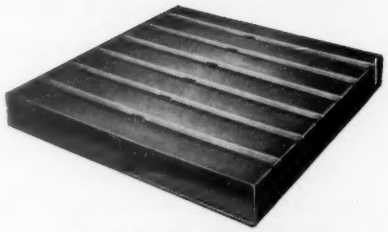
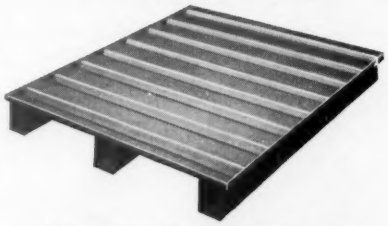
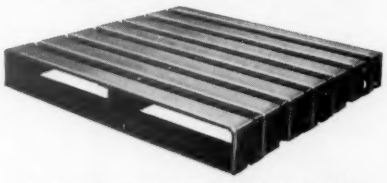


P-14 Double Face Steel Pallet.



P-12 Single Face Steel Pallet with two- or four-way entry.



P-16-S Semidouble Face Steel Pallet for use with trucks with retractable wheels as well as fork-lift trucks.

REPUBLIC STEEL

Pallets

GIVE YEARS OF EFFICIENT SERVICE AT MINIMUM COST

Republic Steel Pallets are designed to eliminate maintenance expense — designed to eliminate broken deck boards, protruding nails, split stringers and joint failures.

They are strong and rigid with minimum weight. There are no sharp edges or projections to damage materials being handled or to injure workmen.

Pallet styles illustrated are typical examples only. Republic Engineers are available to work with you in the development of a pallet design to meet your individual requirements.

REPUBLIC STEEL CORPORATION
BERGER DIVISION
DEPT. K-8767-AR
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( ) Please send Steel Pallet Catalog.
( ) Have an Engineer call.

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

K-8767

"Tough-to-make"
Cold-Headed Products like these . . .

- Tubular Rivets (Punch Extruded).
- Non-threaded, multi-diameter, head and shoulder parts, drilled or not drilled.
- Washer and binding head screws with rolled threads.
- Special design fastenings and other small parts of intricate shape, with or without requirements for drilling or threading.

. . . become "routine" with

SCOVILL

EXTRUDED

Cold-heading WIRE

(Cartridge Brass, 70%)

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

IT ELIMINATES

1. **OUT-OF-ROUND HEADS**
2. **INCOMPLETE FILLING-OUT OF HEADS AND SHOULDERS**
3. **ROUGH "ORANGE PEEL" EFFECT**
4. **UNSOUND HEADED PARTS**
5. **RED STREAKS AND STAINS**
6. **NON-UNIFORM FLOW**

SCOVILL

Send for new folder.

Scovill Cold-Heading Wire is extruded from CONTINUOUS-CAST brass billets by the hot extrusion process, then cold-drawn and annealed in accordance with closely controlled mill procedures.

CONTINUOUS CASTING produces *more uniform metal* than any other process, both in chemical composition and in freedom from casting flaws or other variations.

Scovill has standardized on *Cartridge Brass,* 70% for wire to be used in cold-heading operations. This alloy has a 5% HIGHER COPPER CONTENT than is generally found in brass cold-heading wire and is more ductile.

Prove this on your next wire order. Let us help you specify the proper closely controlled Scovill temper to produce more nearly perfect headed brass parts . . . whether you require "flow" characteristics for heading, or "flow" plus essential rigidity for secondary machining.

SCOVILL MANUFACTURING COMPANY, Mill Products Division
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128C58

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WOOD REELS IN ALL SIZES FOR ALL TYPES OF ELECTRIC WIRE AND CABLE . . .

B. J.—
This looks interesting to us in Production. Suggest you investigate Bridge Reels today. Advise me when you hear from Bridge
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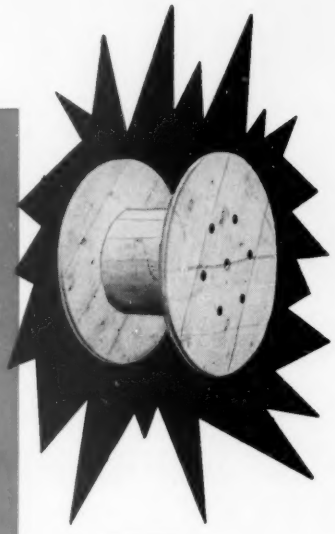
YES

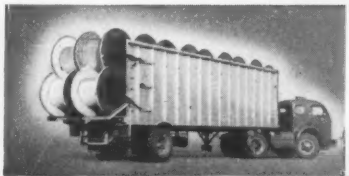


YOU SAVE WITH NON-RETURNABLES

LOOK AT THE ADVANTAGES

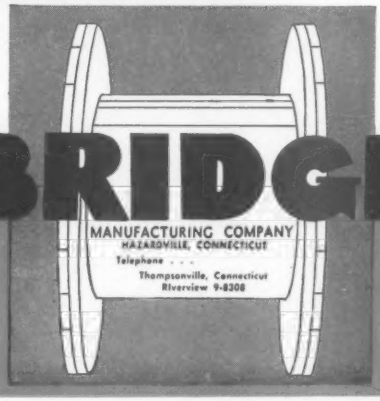
- **Reduce Reel Investment**
- **Less Storage Space**
- **Lower Freight Cost**
- **No Bookkeeping**
- **No Repair Costs**
- **No Return Freight**
- **No Deposit**
- **No More Headaches**

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST



HIGH SPEED
SHIPPING SERVICE IN OUR OWN TRUCKS

within a radius of 200 miles from the plant. Fast freight will bring you Bridge reels within a few days east of the Mississippi.



"REEL GOOD . . .

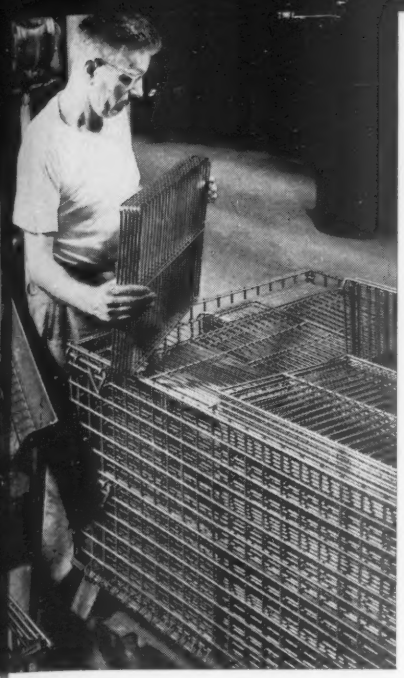
Let us quote on your reel needs. Send us your specifications. Better yet, visit our plant and see how and why Bridge reels are made so well at so low a cost.

WOOD REELS"

Baskets for a combination refrigerator-freezer enter plating line on conveyor. They are shown here leaving the first bath, an alkaline cleaner, and moving to a clear water rinse. A total of 15 immersions are given these baskets in the process of plating them with a .0005 inch coating of zi Below: The excellent surface required for plating is shown the Pittsburgh Steel wire stockpiled at Bauer Bros. Co. its Springfield, Ohio, wire division.

Bauer Bros. Gets Extra Clean Wire For Fully Automated Plating Lines

Defect-free Finish of Pittsburgh Steel Co. Wire Eliminates Costly Surface Preparation



This machine was designed and built by Bauer Bros. own personnel to speed the efficient production of racks, seen here coming off the end of the unit.

On this automatic multi-welder, design-specified by William Cannell, right, Bauer Bros. Co. master mechanic, a total of 288 different combinations of welds can be made. Here the operator is welding wire to a solid bottom basket for use by a major appliance manufacturer.

Bauer Bros. Co. demands, and gets, from Pittsburgh Steel Company extra smooth, clean, bright wire which can go into plating lines without any expensive surface preparation.

This is only possible with wire that has an extremely clean, defect-free surface.

Bauer Bros. Co. keeps its Springfield, Ohio, plant's automated plating line running smoothly with consistently excellent results.

The Wire Division of Bauer Bros. Co. fabricates wire shelves, racks and baskets for refrigerators, freezers, ovens and other appliances made by virtually every major appliance manufacturer.

Bauer Bros. buys coils of wire which it cuts into proper lengths, straightens and then forms into finished products on automatic shaping and welding machines, many of which were designed by Bauer Bros. personnel.

On these machines, Pittsburgh Steel's bright basic wire gets its first test. Good grain structure gives the wire ability to take severe bending without ripping or tearing. Uniform hardness from coil to coil and from shipment to shipment speeds production and holds down rejects.

• **Meets Customer's Demands**—On a completely automated plating line, Pittsburgh Steel wire meets Bauer Bros. demands for freedom from pits, seams and porosity.

So, Pittsburgh Steel wire helps Bauer Bros. Co. two ways:

1. More economical production on automatic machines and on plating lines.

2. Improved appearance of the final product adds to salability.

Bauer Bros. Co. can plate its wire products with any of these coatings:

A combination of copper, nickel and chrome; zinc, clear or colored lacquer, and plastic (the new Corvel Fusion Bond process).

Products come to the plating line on an overhead conveyor directly from the Fabrication Department. Without any stops, the conveyor immerses products in a series of tanks on the plating line. In zinc plating, pictured here, baskets are dipped in a total of 15 tanks without a halt and without the intervention of a human hand. Drying and baking complete the plating cycle.

On these baskets, destined for use in a new combination refrigerator-freezer made by one of the country's largest appliance manufacturers, the zinc coating never falls below .0005 inch.

After plating, coatings are laboratory checked for porosity, density and resistance to wear and corrosion. In one test, products are enclosed in a salt air immersion chamber where temperature is maintained at 100 degrees F. and humidity at a sweltering 100 percent. A five percent salt solution gives the zinc a rugged workout.

Standards like these, rigidly maintained, call for the best in wire. The wire must be the ultimate in cleanliness, smoothness and uniformity. Pittsburgh Steel wire meets these specifications day in and day out.

Like Bauer Bros. Co., you also can get production economies and a more salable product from the use of Pittsburgh Steel's basic wire. Whatever you make from any type of manufacturers wire—from nails to precision springs—let a Pittsburgh Steel representative show you what Pittsburgh Steel quality and service can do for you. You can start benefiting today by getting in touch with the nearest district sales office.

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

HIGH SPEED
AUTOMATIC SHAFTLESS TAKE-UPS

ENTWISTLE
MANUFACTURING CORPORATION

TYPE DM-18-24 Automatic Dual Take-Up is capable of winding 24" diameter reels at speeds to 4000 F.P.M.

Speeds up to 4000 F.P.M. on wire down to No. 26 A.W.G.

Positive Automatic Wire Transfer

Maintained spooling tension with controlled dancer position

Pneumatic Reel Engagement

Individual drive motor for each reel.

Hydraulic Traverse.

Your extruder will reach a new high in production and efficiency with an EMC Automatic Shaftless Take-Up. This unit permits continuous take-up speeds up to 4000 F.P.M. on wire sizes down to No. 26 A.W.G. with maintained wire tension.

Rapid transfer to the second reel can be accomplished automatically from counter signal or by manually operated push button. Pneumatically operated side arms make loading and unloading a simple, easy operation. Hydraulic traverse is infinitely adjustable over a wide range.

Find out what the NEW Entwistle High Speed Automatic Shaftless Take-Up can do for your extruding operations. Write or phone for complete details.

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1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND
Over 40 years of dependable service to the Wire Industry

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THE KEMSON ENGINEERING CO., LTD.
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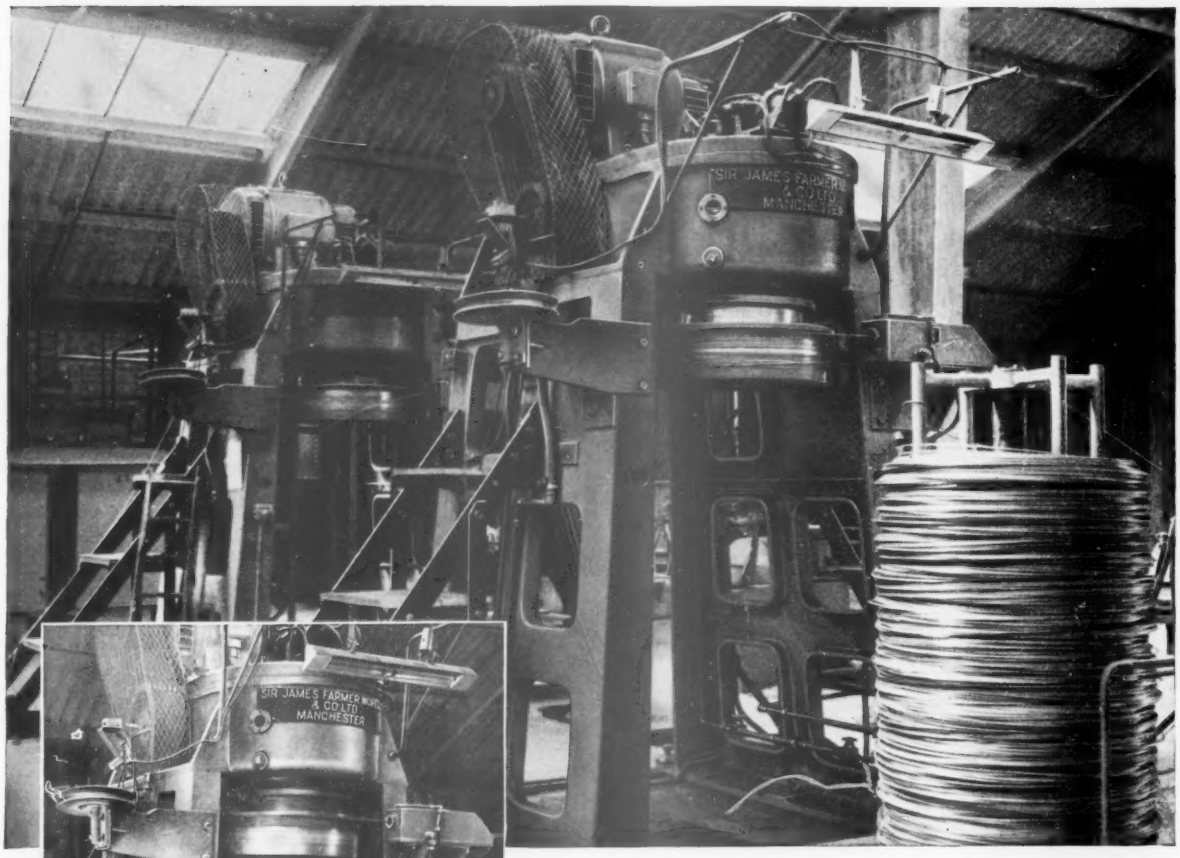
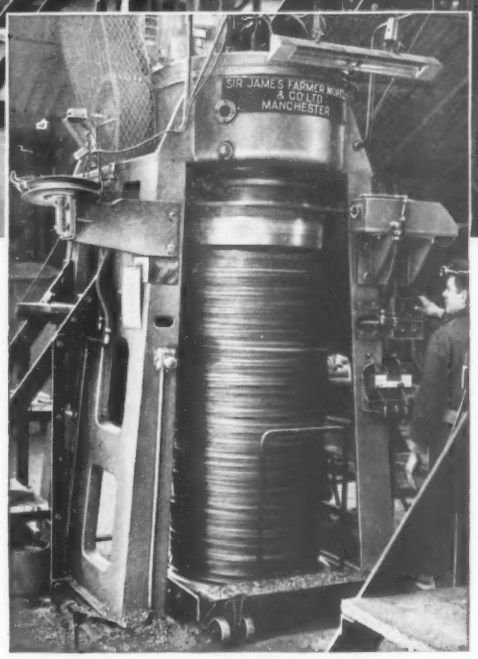




Photographs by courtesy of G.K.N. Reinforcements Ltd.

The above shows a double draft Gravity block drawing ton coils of steel wire for the manufacture of reinforced concrete fabric. This machine is capable of drawing all sizes from ½" rod down to 12 s.w.g. in double or single drafts.

THIS SYSTEM ENSURES

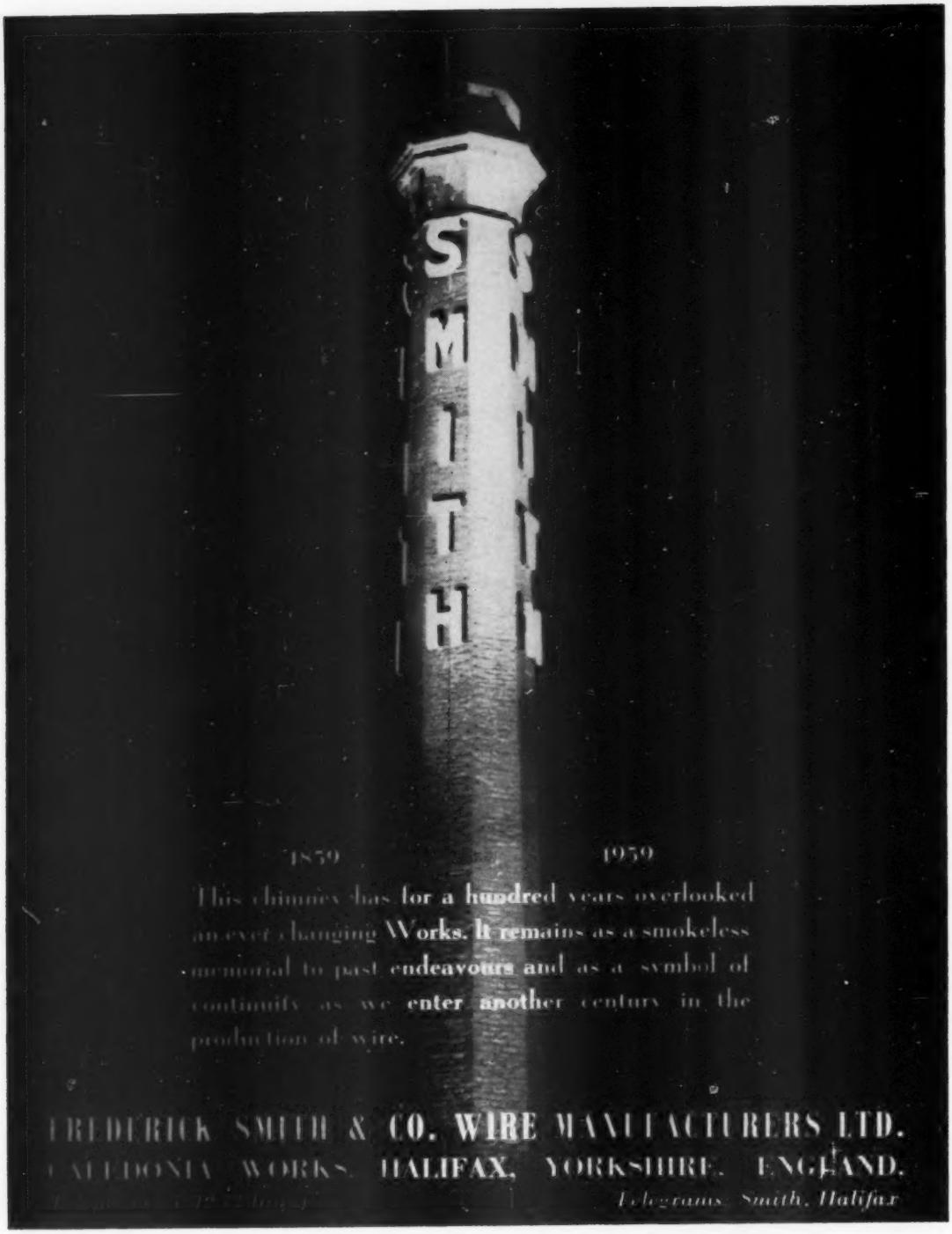
- ★ high machine efficiency
- ★ reduction in handling times and ease of handling after drawing
- ★ long runs on the fabric making machines, which obviate machine stoppages for welding and changing swifts

Makers of all classes of Wire Drawing Machinery and pioneers of the inverted block system for handling large coil weights.

Sir James Farmer Norton & CO. LTD.

ADELPHI STREET • SALFORD • LANCASHIRE • ENGLAND

Sole Representative in U.S.A.: Steel & Wire Machine Co., 15457 Euclid Ave., Cleveland 12, Ohio. MUlberry 1-7151


SMITH
1859 1959
This chimney has for a hundred years overlooked an ever changing Works. It remains as a smokeless memorial to past endeavours and as a symbol of continuity as we enter another century in the production of wire.
FREDERICK SMITH & CO. WIRE MANUFACTURERS LTD.
CALEDONIA WORKS, HALIFAX, YORKSHIRE, ENGLAND.
Telegrams Smith, Halifax

these thermatic Series* extruder

features mean higher production on every job!

Simplified one piece cylinder with integrally cast-in Xalloy liner.

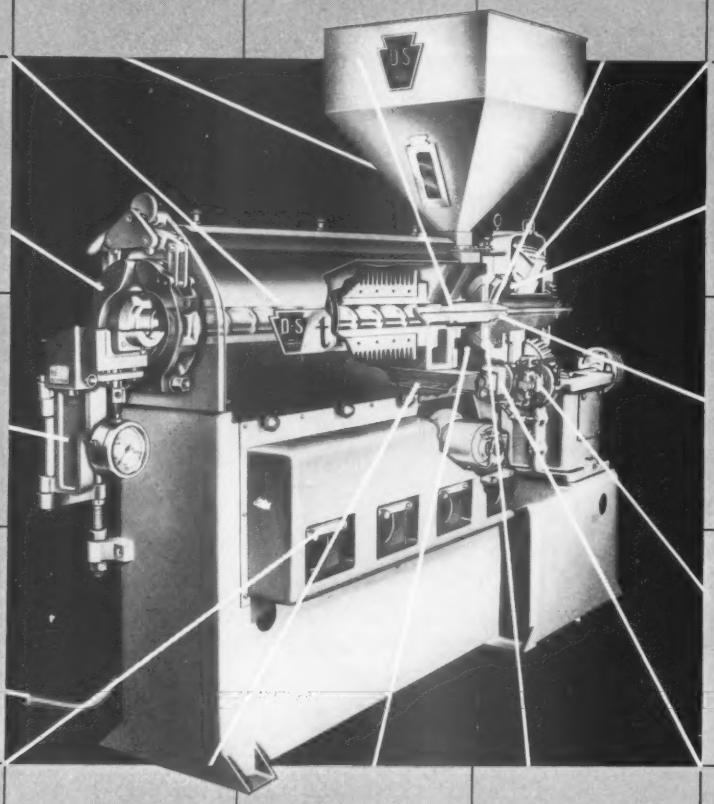
Extra large capacity stainless steel hoppers.

Screw flight extends back beyond the feed throat opening for improved powder and granule feeding.

Four-spline screw drive eliminates the eccentric screw rotation of a single key drive.

Helical gearing — smooth, efficient, free-running. Greatly increased horse-power capacity.

New stronger head clamp. Simplified opening and closing of head with positive safety shear pin arrangement.



Higher thrust bearing capacity. Extra-heavy separate thrust and radial bearings handle their respective loads individually to meet constantly increasing production requirements.

Improved hinged head support swings completely clear of the front of the extruder.

Tapered drive end of stock screw positively centers screw and simplifies removal.

Heaters and controllers completely wired for fast inexpensive installation.

Gear type oil pump, positively driven from input shaft, lubricates all bearings and gears regardless of speed.

Damper arrangement provides several gradients of natural draft cooling. Blowers provide high circulation for stubborn cooling jobs.

Air-tight oven effect adjustment by new second set of dampers for high temperature extrusion.

Access opening allows easy replacement of bronze feed throat bushing.

Labyrinth oil seals — simple non-wearing design. No oil seals or rings to replace.

Built-in direct drive stock screw electric tachometer.

Greater cylinder lengths standard on all extruder sizes with optional L/D ratios available. **2½", 3½", 4½", 6" and 8" models available.** The New D-S thermatic Series Extruders will outproduce — size for size — any other extruder on the market today. For complete specifications and details write to:

D-S

DAVIS-STANDARD

Division of FRANKLIN RESEARCH CORPORATION

16 WATER STREET, MYSTIC, CONNECTICUT

*Patented

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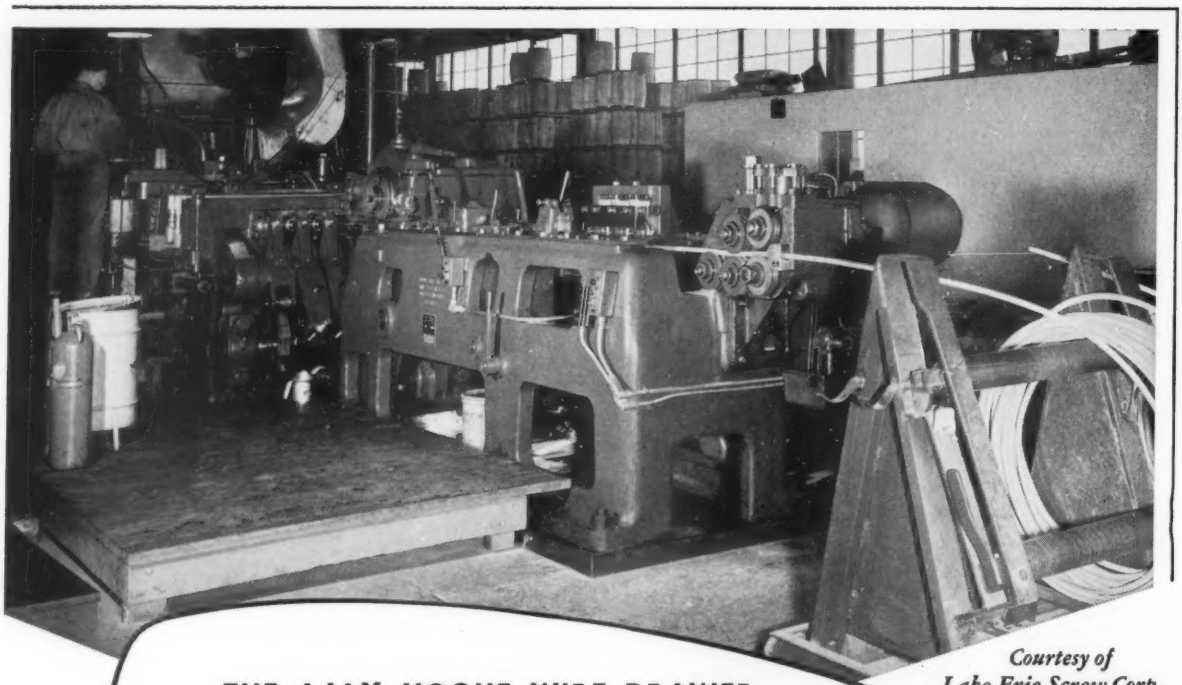
DRAW STRAIGHT and ACCURATE WIRE FROM COILED RODS



Courtesy of Lake Erie Screw Corp., Cleveland, Ohio

THE AJAX-HOGUE WIRE DRAWER
is a complete wire drawing unit custom designed to fit any make cold header or cold nut former. It cold draws wire in a straight line and coats wire from hot-rolled, pickled and limed rod as it feeds into the header.

A wire drawer attached to your header assures easier heading and improved products . . . The wire enters the header straight and gives straightness to the headed product. You are sure of uniformly accurate size wire from successive coils.

Write for Bulletin 111-A

Ajax-Hogue Wire Drawers

AN ATTACHMENT FOR COLD HEADERS AND COLD NUT FORMERS

designed and built by

THE Ajax MANUFACTURING COMPANY

CLEVELAND 17, OHIO

110 S. DEARBORN ST., CHICAGO 3, ILLINOIS

W. P. WOOLDRIDGE CO. - BURLINGAME, CAL. - LOS ANGELES 22, CAL.

FOR UNIFORM LIQUOR FINISHES...

APEX 764-M assures . . .

- **Rapid Removal of Metallic Soaps and Lime**
- **Long Solution Life**
- **Short Acid Immersion**
- **Tightly Adherent Plating**

APEX 764–M Cleaning Compound is a moderately alkaline, powdered form composition, especially formulated for removal of insolubles found on cold drawn steel wire.

Its use greatly enhances cleaning and reduces preparation time of hard drawn wire that is to be subsequently copper or liquor finished.

Inquiries Invited!

APEX ALKALI PRODUCTS CO.

Lubricants & Cleaning Compounds for Wire and All Wire Products

Main and Rector Sts., Phila. 27, Pa.

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Place Your Order **NOW** *for*

THE NEW AND REVISED 1959 EDITION OF THE

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AND YEAR BOOK of THE WIRE ASSOCIATION

The many new headings, new products, address changes and other important information changes in the listings of sources of bars, rods, wire, wire products, electric wire and cable and of sources for machinery, equipment and supplies used in the Wire Industry, make this directory

INDISPENSABLE!

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LIST OF MEDAL AWARD WINNERS AND HONORABLE MENTION AWARDS.

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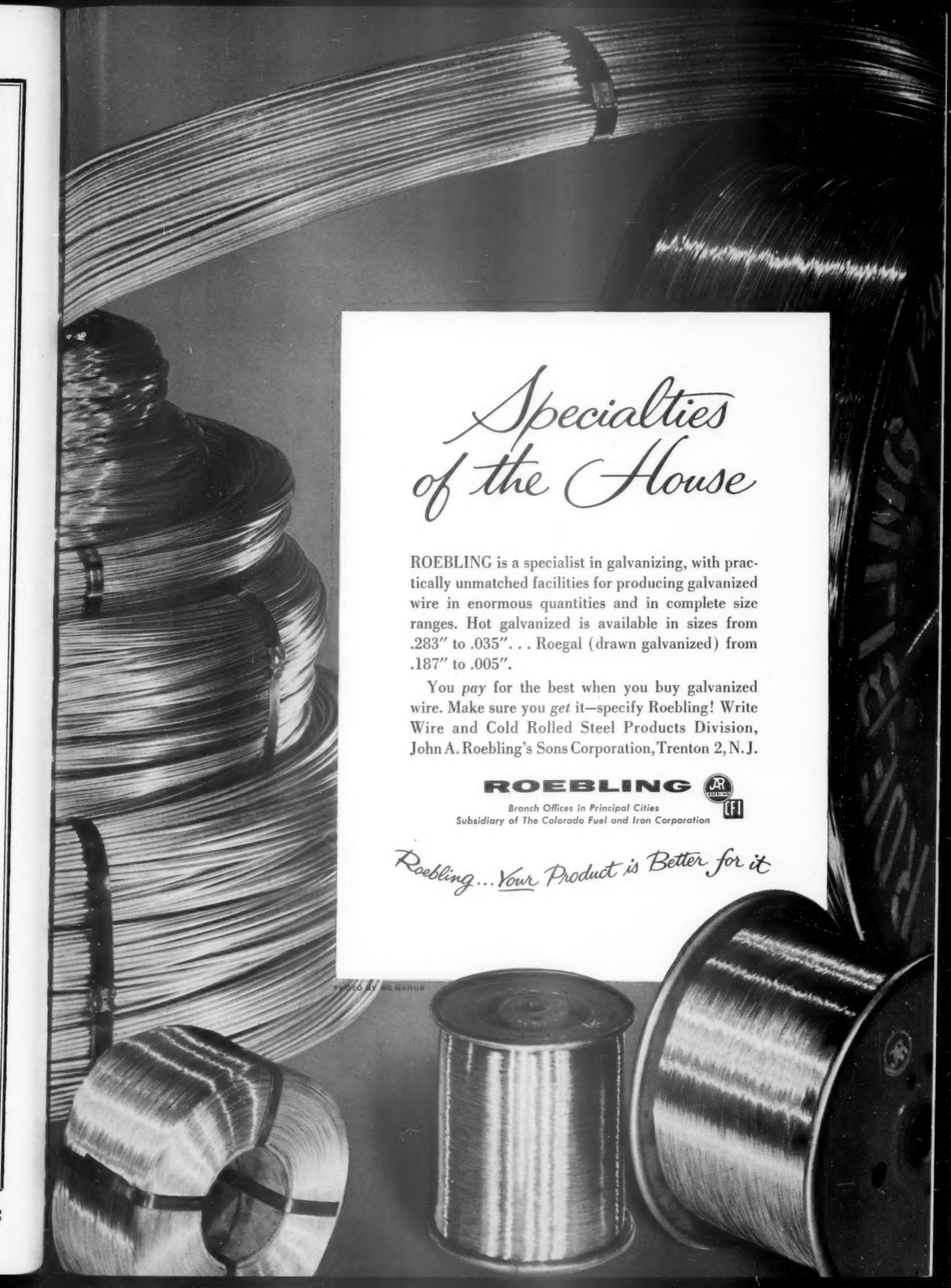
453 MAIN STREET ● **STAMFORD, CONN.**


Specialties
of the House
ROEBLING is a specialist in galvanizing, with practically unmatched facilities for producing galvanized wire in enormous quantities and in complete size ranges. Hot galvanized is available in sizes from .283" to .035"... Roegal (drawn galvanized) from .187" to .005".
You *pay* for the best when you buy galvanized wire. Make sure you *get* it—specify Roebling! Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.
ROEBLING
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation
Roebling... Your Product is Better for it

The machine illustrated is a cathode ray tube washing machine, part of a complete plant incorporating in addition screen settling conveyors, screen lacquering machines, rotary aluminizing machines, gun sealing machines and other tube handling equipment.

Generally speaking

we are very particular

about the way we conduct our business. There is no "taking for granted" as far as we are concerned. Our work is far too technical for that. So technical that it is usually initiated right at the top—by the people who are at the top because of their experience, skill and engineering comprehension. For instance this year alone our Directors and executives have visited on business almost every country in Europe, the U.S.A. and Canada, and similarly we have received visitors from Asia, South Africa and many of the other countries mentioned. But, of course, these missions are only undertaken when advice and planning is required. For the installation of a complete cable or transformer impregnating plant, cable sheathing and re-winding plant, or a high vacuum processing plant, for example. It should be remembered that all these installations are composed of different items of equipment made in our works. For instance we make vacuum and viscous fluid pumps, extruders, capstan and caterpuller units, paper conditioning, varnishing and tube winding machines to quote but a few. These can often be used in conjunction with existing plant or machinery. To be given some idea of the range of our products you should send (without obligation) for a copy of our "Summary of Products" brochure. You may find that our specialised experience can be of great help to you sometime.

General Engineering Company (Radcliffe) Limited

Station Works, Bury Road, Radcliffe, Lancs., England

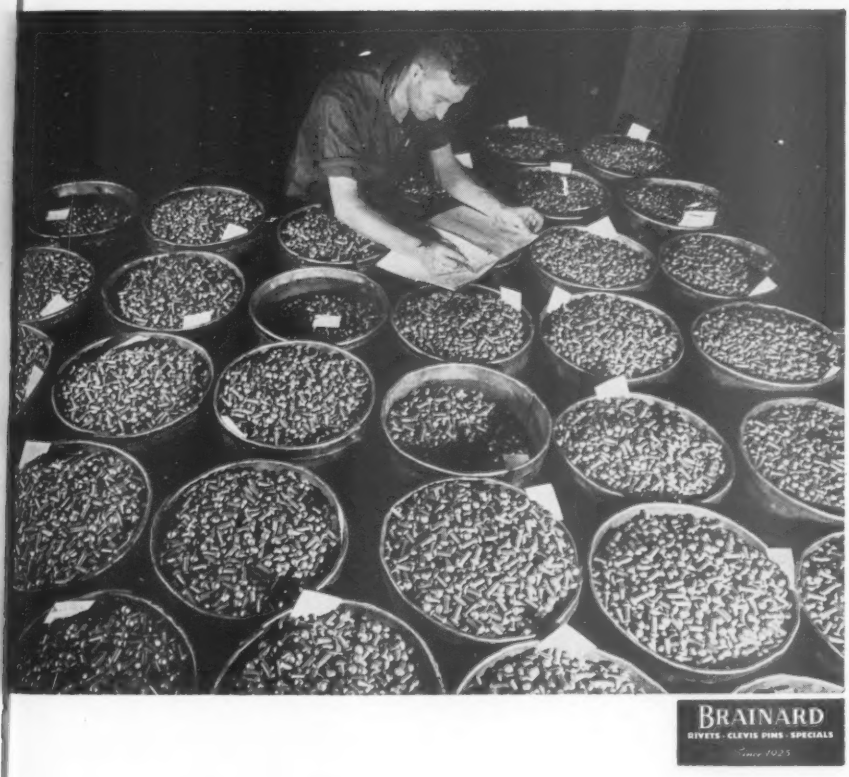
Telephone: Radcliffe 2291 (4 lines) Telegrams: "General", Radcliffe, Manchester

Represented in nearly every country in the world

Thousands of rivets or blanks for cold headed Brainard Specials are produced in only minutes (3½ million pieces daily) on this battery of modern cold headers from Youngstown Rivet Quality Wire.

Accent on excellence

Youngstown solid rivet wire



Brainard Rivet Company of Girard, Ohio, daily produces rivets "by the millions". But they realize a rivet is only a rivet—so quality and fast, dependable service are the products they're really selling.

To help in maintaining Brainard's high product quality on a steady, dependable production basis is Youngstown's Solid Rivet Quality Wire. It is free of all injurious seams and inclusions which guarantees long, trouble-free production runs on Brainard's cold headers.

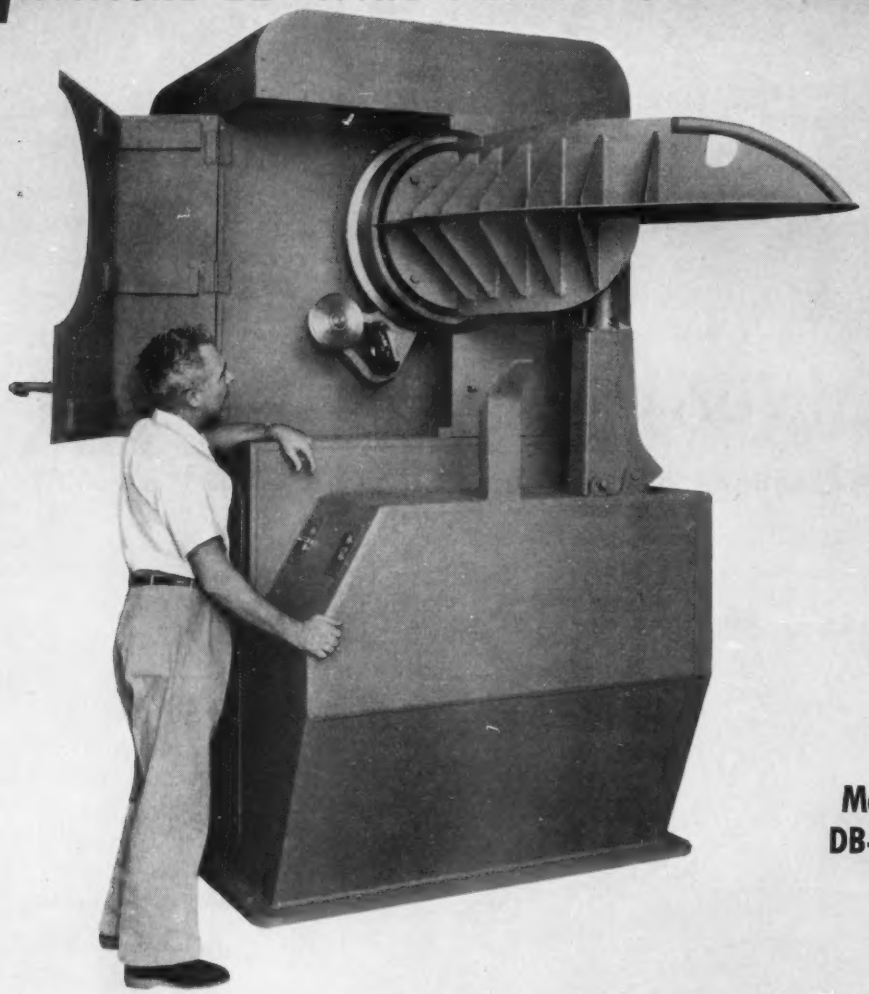
Wherever steel becomes a part of things *you* make, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create products with an "accent on excellence".

QUALITY YOUNGSTOWN SERVICE

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel, Youngstown, Ohio

WHITACRE 22″ WIRE DRAWING DEAD BLOCK



Model
DB-22A

Continuous Production—Efficiency Approaching 100%

Gives you these advantages

Continuous increased production achieved by: • No down time for stripping • Permits packaging into stationary container or uninterrupted palletizing on stems • No tangling nor snarling from handling • Design simplicity. No back-gearing nor similar mechanisms • Greatly reduced floor space requirements • Dies in supplying drawing machine can be changed without stopping dead block • Accumulation type machines can be "run down" without stopping dead block • Continuous inspection and sampling • Breaks welded in production — low scrap loss • Increased production with lessened operator fatigue • Maintenance eliminated except for occasional lubrication of four main bearings and two motor bearings • Dead block can be located anywhere with wire literally piped from wire drawing machine • Extra large packages for in-process wire • Greatly reduced handling and in-plant transportation costs • Low capital investment.

OTHER MODELS AVAILABLE

16″ Wire Drawing Dead Block, Model DB-16A • 26″ Wire Drawing Dead Block, Model DB-26A • Combination 16″ and 22″ Galvanizing or Tinning Dead Block Take-ups, Model GB-2216A • 26″ Heavy Wire Galvanizing or Tinning Dead Block Take-up, Model GB-26B.

Write Today For Specifications And Name Of Nearest Distributor

WHITACRE ENGINEERING & MANUFACTURING COMPANY

5649 ALHAMBRA AVENUE • LOS ANGELES 32, CALIFORNIA • CAPITOL 5-2476

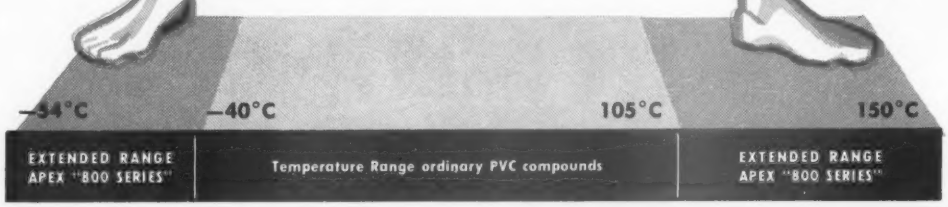
WHITACRE

Bulletin from the Big "A"

APEX

in one giant stride . . .
A MAJOR BREAKTHROUGH
IN PVC COMPOUNDS!

New APEX 800 Series PVC compounds extend temperature ranges on both High and Low ends



This is nothing less than a major breakthrough for PVC compounds. In one giant stride, ***temperature ranges have been extended on both high and low ends.***

For example, today's best compounds perform well in a temperature range from —40°C to 105°C. Apex "800 series" compounds perform *better* in a range from —54°C to 150°C.

Throughout the entire operable temperature spectrum, each of the new Apex 800 series compounds push back limitations — extending temperatures considerably below and far above previous compounds.

There has been no compromise of other properties to obtain this astonishing improvement in temperature resistances. The new Apex 800 series actually offers improved dielectric strength, greater flexibility, better humidity resistance.

For complete technical data, write today for data sheet number 800.

APEX TIRE & RUBBER CO.
PLASTICS DIVISION Pawtucket, R. I., U.S.A.

Fast Operating Utility Type Models J-3-S & J-4-S Automatic MICRO-WELD Butt Welders For Steel And Steel Alloy Wire

MICROMETER PRECISION MICRO-WELD ®

Model J-3-S and J-4-S MICRO WELD Butt Welders for steel wire.

These welders are used for welding high and low carbon Steel & Steel alloy wire ranging in size from .020″ to .160″ diameter.

All operations on these units, which include clamping the wire, contacting the weld switch, and applying the upset spring pressure, are made by a single downward stroke of the foot pedal.

Model J-3-S Welder
Capacity .020″ to .080″ diameter.

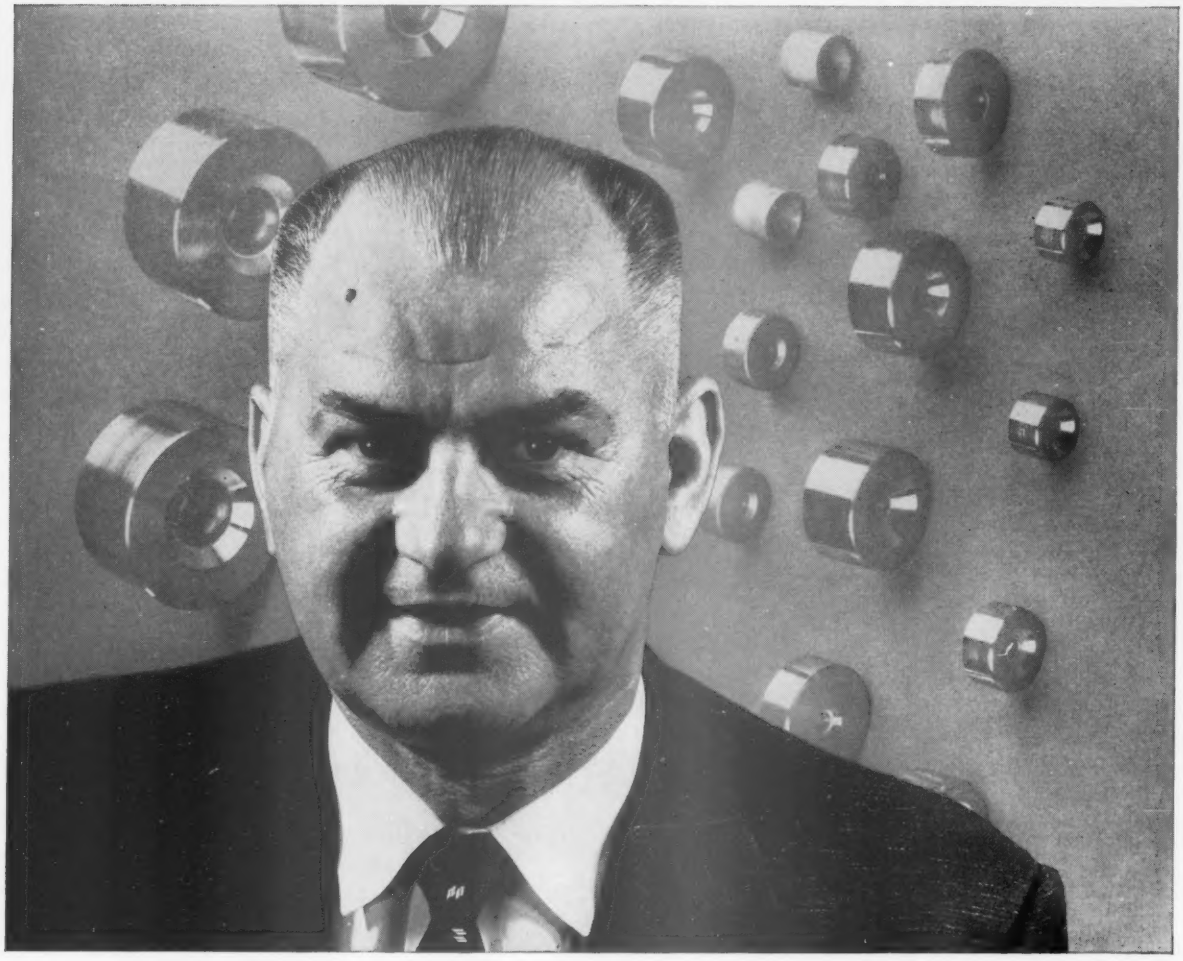
Model J-4-S Welder
Capacity .040″ to .160″ diameter.
STEEL, STEEL ALLOYS,
AND THERMOCOUPLE WIRE.

MICROMETER PRECISION MICRO-WELD ®

MICRO PRODUCTS CO.
20 NORTH WACKER DRIVE
CHICAGO 6, ILLINOIS
Telephone STate 2-7468

Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY



Picture of the "Plus Value" in Firthaloy Dies

Chances are you've recognized Eddie Miller's picture above. There's also a good chance that he's helped you—with plant layout, purchase of equipment, die design, or in a dozen other ways—just as he's helped so many others during the past quarter of a century. That's why he and his staff have become a symbol of the "plus value" you get in Firthaloy Carbide Dies.

This unequalled knowledge and experience is yours for the asking. When you add this "plus value" to the recognized superiority of Firthaloy Carbide Dies for longer wear, better finish, and lower costs, you have a combination that can't be beat.

To add Eddie Miller to your staff, but not to your payroll, write: Eddie Miller, Firth Sterling, Inc., 3113 Forbes Avenue, Pittsburgh 30, Pa. Offices and warehouses in principal cities.

"Your Future is Great in a Growing America"

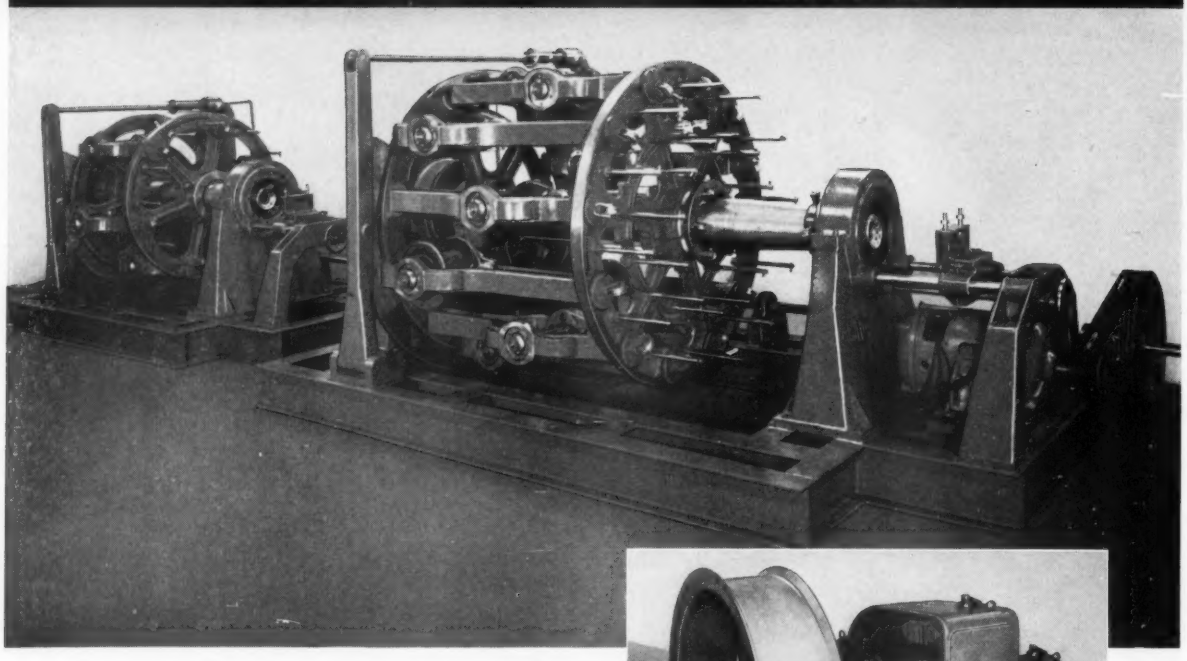
PRODUCTS OF **Firth Sterling** METALLURGY

HIGH SPEED STEELS • TOOL & DIE STEELS • STAINLESS SPECIALTIES • HIGH TEMPERATURE ALLOYS
SINTERED TUNGSTEN CARBIDES • HEAVY METAL • CERMETS • CHROMIUM CARBIDES
ZIRCONIUM • STERVAC & STERCON SUPER ALLOYS

FIRTH STERLING TRADE MARK

NEBUTTCO

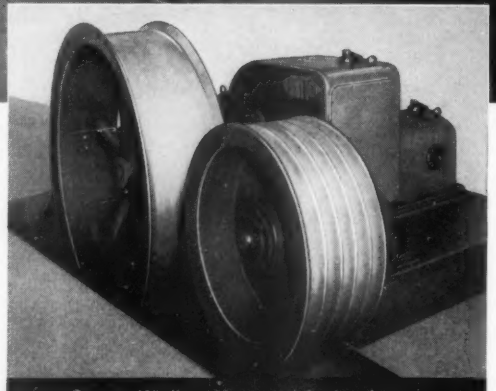
Planetary Stranders



Planetary Strander with 6-12 head planetary sections for 16" dia. reels.

Designed and built with Nebuttco's long experience in manufacturing high quality cable-making machinery, these rugged Planetary Stranders are well known in the industry for their reliability in producing cables at a profit day in and day out.

These high speed machines can be supplied to accommodate a number of different reel sizes — and in various combinations for producing strands from 7 to 331 ends. Capstan units are available up to 96" diameter. We can also supply let-offs and take-ups as well as taping heads both concentric and eccentric. Write us for further information and details.



Capstan 60" dia. with grooved fleeting sheave.

BRAIDERS
CABLERS
TAKE-UPS

NEBUTTCO

BUNCHERS
STRANDERS
TAPING MACHINES

NEW ENGLAND BUTT COMPANY
Division Wanskuck Company
304 Pearl Street • Providence 7, R. I.
In England — James Day (Machinery) Limited, 28 Maddox Street, London, W1

I HAD THE BOSS UP A POLE...

"He knew all about the operating advantages of polyethylene coated wire . . . but I took him up and showed him why I liked it and why it's saving the company even more money than he figured."

In the past 12 years polyethylene covered line wire and cable have chalked up outstanding service records for utilities. But some of the best reasons for using polyethylene coatings don't turn up in operating statistics —they come from the men whose job it is to install and maintain the lines . . . Reasons such as these:

Polyethylene Is Easier to Install

It's free stripping, yet has excellent adhesion and will not ruffle over cross arms. It's clean to work with and its surface is "slippery" too. Polyethylene coating is lighter than other types of covering . . . it handles easier.

Polyethylene Covered Line Wire Saves Outages

Polyethylene forms a complete and permanent covering over line wire. That means fewer outages from contact with trees, wind-blown swinging wires and foreign objects. Smaller diameter polyethylene coatings offer less wind resistance above ground. Lighter weight can be an advantage, too, in ice storms.

In field servicing . . . in over-all performance and service life—polyethylene has proved its superiority in wire and cable applications such as these:

- Line wire covering
- Power cable dielectric
- Tree wire covering
- GTO (Neon Sign) Cable
- Coaxial Cable
- WD-1 Infantry Field Wire
- Control cable insulation and jacket
- Communication cable insulation and sheaths
- Corrosion protection for metal sheaths.
- TV Lead Wire

U.S.I.'s extensive line of PETROTHENE Polyethylene resin compounds, specially tailored for various types of electrical insulation or jacketing and sheathing, are outlined in a new brochure, "PETROTHENE Resins for the Wire and Cable Industry." Also available is our "PETROTHENE Polyethylene . . . A Processing Guide." Write us at the address below for your copies of either or both.

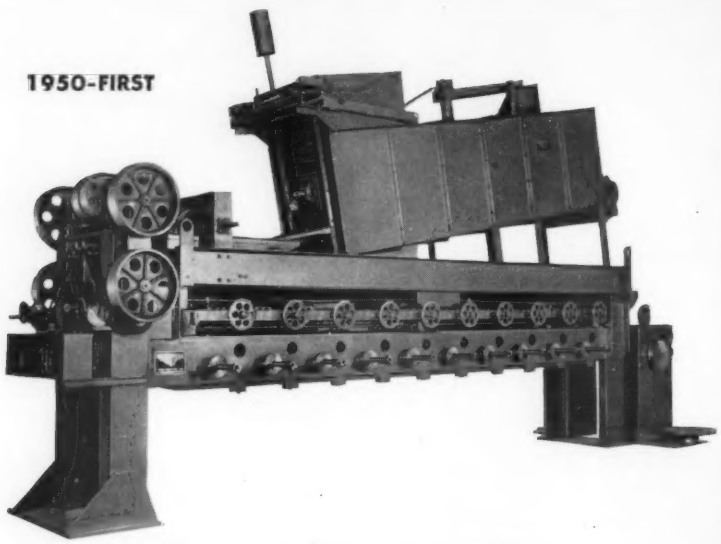
U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

Makers of PETROTHENE Polyethylene Resins

PROVEN FIRSTS

MODERN PRINCIPLES FOR WIRE PROCESSING

1950-FIRST



SELF-GENERATING ATMOSPHERE ANNEALERS

1950—FIRST to develop and install successful gas-fired recirculating controlled combustion annealing ovens. Shown above mounted on a MOCO dual spooler for tandem operation with wire enameling equipment.

This series of annealers is available for horizontal inclined or vertical mounting positions. No external source of inert atmosphere is needed.

1952-FIRST

VERTICAL WIRE ENAMELING OVENS

1952—FIRST to develop and install a vertic two-zone high velocity axial flow recirculati wire enameling oven with internal recuperati catalytic unit which eliminates condensate a recovers latent solvent energy.

Five other models complete the range from t finest wire through large rectangles. Rapid he impartation and a high degree of temperatu uniformity provide greatly increased productio and quality.

WIRE EQUIPMENT DIVISION

MICHIGAN OVEN COMPAN

425 Brainard • Detroit 1, Michiga

For the engineering achievements that keep you competitive—look to MOCO

Why? Because There Is No Substitute For Experience

FOR GREATER OUTPUT—MOCO FEATURES MODERN RECIRCULATING OVENS IN WIRE PROCESSING MACHINES

In the early 1930's radiation type and gravity convection type equipments were replaced by high velocity recirculating atmosphere principles.

This was progression. So were other new principles introduced then or soon after. They made these early ideas as obsolete as the hand cranked automobile.

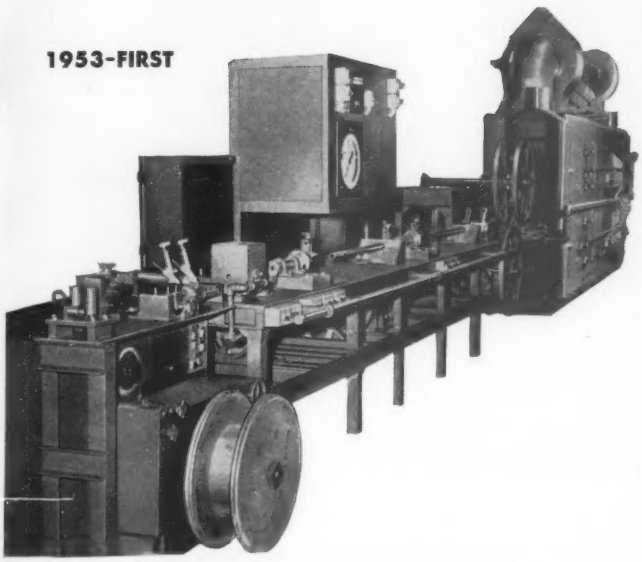
Unfortunately, the builders of wire processing machines did not keep pace with these trends and avoided the expense of remodeling existing machine designs. This forced many wire processing manufacturers to design and build their own equipment—but, of course, without the advantage of continued wide experience in heat processing techniques or of low cost standardization and production procedures.

* * *

On these pages are shown some of the "firsts" which carry the MOCO name plate. Acceptance of these engineering concepts in the wire processing industry has been such that other equipment manufacturers have found it necessary to adopt the same principles.

These "firsts" are evidences of progressive thinking balanced with years of experience—*and of engineering achievements* that have brought to the industry greater production output, higher quality products, and reduced production cost.

1953-FIRST



1956-FIRST

RAPID COOL – VARNISH IMPREGNATING OVENS

1953—FIRST to develop and install rapid cool tunnel type varnish impregnating ovens. Shown above is MOCO's double insulating machine and layer wind takeup. This machine applies two servings of glass or yarn and four coats of baked insulating varnish simultaneously (up to 150,000 C.M. area). Permits wire stoppage without damage to wire in the oven—returns to full production in seconds, because of the rapid rise of temperature in the oven.

REEL-R-DRUM PACKERS

1956—FIRST to develop and install a universal wire packaging machine with combination takeup unit permitting packaging of wire on 6" or 12" diameter spools or in either 100 lb. capacity pails or 500 lb. capacity barrels. Packaging arrangements are optional from spindle to spindle without machine alteration. The complete line accommodates wire sizes ranging from .0130" to .064" in diameter. Speed ranges from 20 to 120 feet per minute.

ANOTHER ENGINEERING ACHIEVEMENT BY

MOCO

For More Details on these Proven Features and Many Others Fill this Handy Coupon

Please send me complete information on the many outstanding MOCO features:

- ☐ Wire Enameling Machines
- ☐ Glass Insulating Machines
- ☐ Other
- ☐ Self-generating atmosphere Annealers
- ☐ Reel-R-Drum Packers

NAME_____ TITLE_____

COMPANY_____ ADDRESS_____

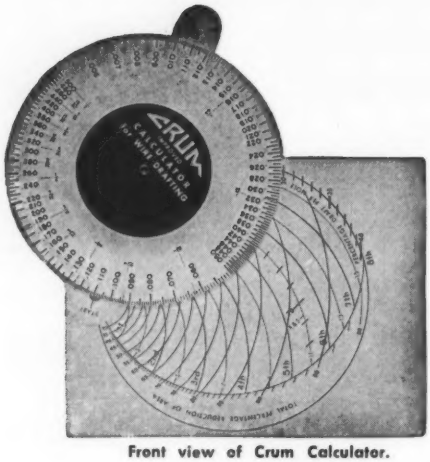
CITY_____ ZONE____ STATE_____

SAVE SET-UP TIME WITH THE . . .

CRUM CALCULATOR

FOR WIRE DRAFTING

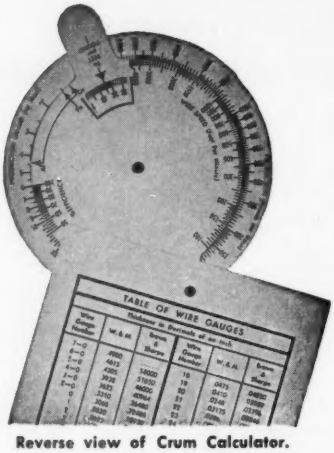
Useful and Accurate!



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

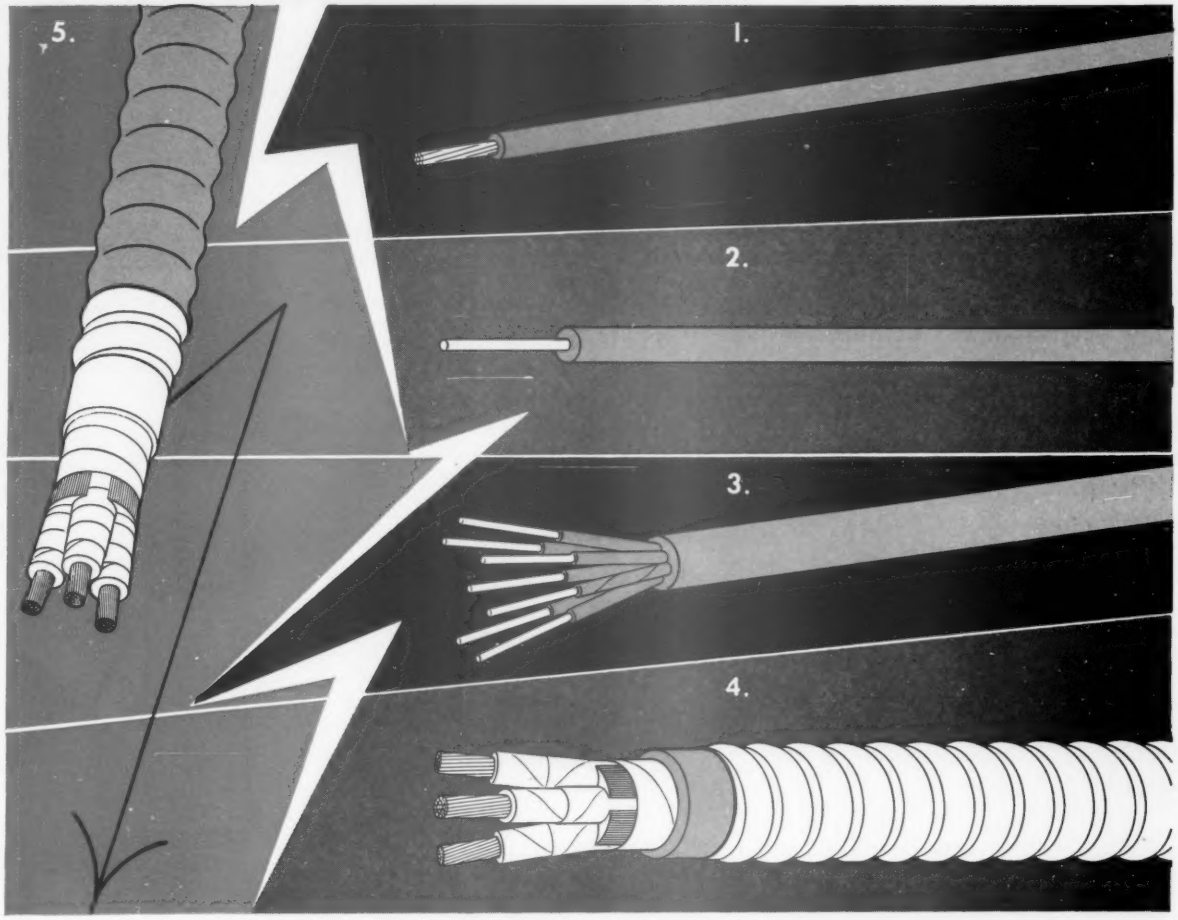
Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

Naugatuck MARVINOL POLYVINYL CHLORIDE RESINS



How General Electric uses Marvinol

Some of the finest electrical wire and cable comes from General Electric Company's Wire and Cable Department at Bridgeport, Conn. Here, polyvinyl chloride—much of it Naugatuck's Marvinol®—is used for a wide variety of purposes:

1. As insulation on Flamenol* single-conductor wire in the 0-600 volt class and on 2-conductor SPT rip cord for 300 volts.

2. As both insulation and jacketing on Flamenol* single-conductor cable for direct ground burial in street lighting series circuits up to 5000 volts.

3. As jacketing over rubber insulation of single- and multiple-conductor cable to provide protection against oil, acid, alkali, ozone and sunlight.

4. As a thermoplastic jacketing under the armor of G.E. varnished cambric interlocked armor cables to provide flame-, chemical- and moisture-resistance and slow aging.

5. As a protective coating over the metal armor of VCI cable where corrosive atmospheres are present. This vinyl coating may also be colored to provide circuit identification.

Whether you manufacture electrical wire, or any other type of wire product that can be made more attractive, more useful or more durable by the application of a vinyl covering, there's a Marvinol resin designed to do the job. Let's talk it over!

*Registered Trade-mark General Electric Company

United States Rubber

129M ELM STREET

Naugatuck Chemical Division, NAUGATUCK, CONNECTICUT

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

DIST. OFFICES: Akron • Boston • Gastonia • Chicago • Los Angeles • Memphis • New York • Phila. • CANADA: Naugatuck Chemicals, Elmira, Ont. • CABLE: Rubexport, N.Y.

With COOK's improved, high speed

HOT-DIP TANK TINNER

you can enjoy production up to

20,000 FEET PER MINUTE!*

Yes, here is America's most advance-design tinning installation Fully complete because it includes a supply stand, flux pot with dip rods and wipes, tinning tank with burner and automatic temperature control units, water cooling tank with recirculating pump and high-speed take-up that maintains constant linear speed. Remember, every part of this machine can be built to suit your own particular individual needs.

CHECK THESE FEATURES:

- Very flexible in its design
- Gives wire perfect uniformity
- Uses improved wiping method and dip rod construction
- Cannot produce rough wire
- Built of rugged, all welded parts
- Takes 12 to 20 lines or spools
- Up to 1000 ft. per minute speed
- Low initial investment

TODAY . . . CALL OR WRITE TO

COOK Manufacturing Co.

50 E. 25th ST., PATERSON 4, N. J., ARmory 4-6380

Wire and cable processing and fabricating machines

*Using 20 lines of fine wire

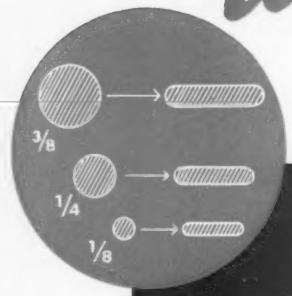
Canadian agent: E. V. Larson Co., Ltd., Toronto ★ In Europe: Capamadjian Le Monnier Cie Ltd., Paris, France

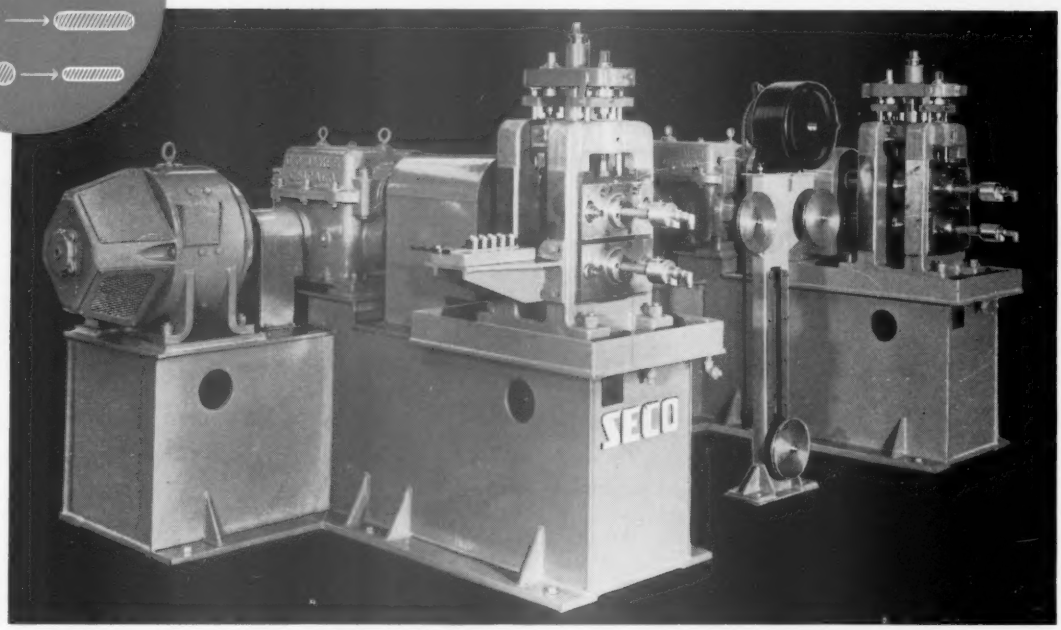
SECO

When You See SECO
You're Seeing the Best!

Wire FLATTENING MILLS

Meet Today's High Standards of Quality and Efficient Operation





Shown above is the SECO 6" Tandem Mill with carboloy rolls and Timken Tapered Roller Bearings. Speed range is from 200 to 800 fpm. The mills are driven by DC motors through combination worm-helical reducers with universal joints, for silent and vibrationless operation. 8" and 10" mills of the same design and construction are also available. Suitable traverse reels are furnished.

Call or write for information and complete data. Consultation invited — no obligation.

STEEL EQUIPMENT COMPANY
P. O. BOX 737, WARRENSVILLE STATION
CLEVELAND 22, OHIO

SECO

WORKING WONDERS WITH WIRE: at Pittsburgh's Steel Company Monessen (Pa.) Fabric Dept.

Northern Indiana Steel's
rugged, new, operation-proved
WIRE CARRIERS and PAY-OFF REELS

PITTSBURGH STEEL'S $111,000,000 EXPANSION PROGRAM called for a new 125-ton 96-inch wire fabric machine, among many other improvements. To feed this monster, Pittsburgh's Monessen (Pa.) Works makes efficient use of 45 advance-design Northern Indiana Steel Supply Company Wire Carriers and Pay-Off Reels.

SAYS SID JOHNSON, FABRIC DEPT. SUPER:
"Because these wire carriers can safely carry up to 4,000 pounds—depending on the gauge and footage of wire—they help us reduce downtime on this new machine. We now need to weld new reels of wire only every 16 hours, the equivalent of two working turns."

In addition, 500 other Northern Indiana wire carriers have been found ideal by Pittsburgh for *storing* wire. The carriers are easily stacked, leaving maximum use of floor area. Result: good housekeeping with minimum effort.

DESIGNED AND PRODUCED TO YOUR SPECIFICATIONS

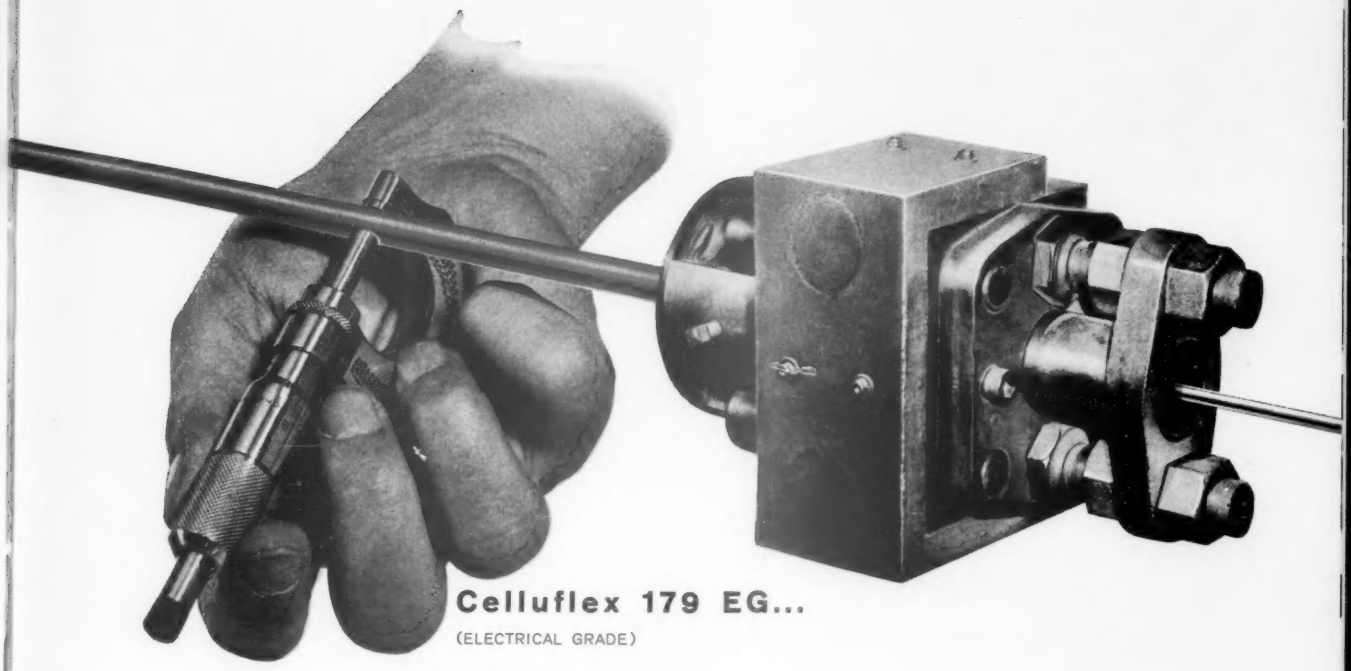
Wire Carriers and Reels that

- ✓ **FEED MORE SMOOTHLY**
- ✓ **CARRY UP TO 4,000 LBS.**
- ✓ **STACK AND STORE EASILY**

Let us know exactly what your operating needs require. If we don't already have it in stock, we're ready to make up your order as per your specifications. In any case, we'll be pleased to quote you promptly in quantities specified.

NORTHERN INDIANA STEEL SUPPLY CO., INC.

Fabricating Division, Michigan City, Indiana
TELEPHONE TRiangle 4-3241



Celluflex 179 EG...

(ELECTRICAL GRADE)

selected for dependability and ease of processing

... add excellent volume resistivity, low volatility, fire resistance, excellent solvating action, oil and water resistance ... result: a tricresyl phosphate specially developed for the wire and cable industry for application in vinyl coverings.

Celanese is an expanding source for plasticizers for many jobs. Shipments from convenient distribution points are ready to meet tight schedules.
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Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Avenue, New York 16, N. Y.

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Celluflex 179 EG ... a Celanese CHEMICALS plasticizer

Call Celanese for: Tris-beta Chlorethyl Phosphate ... *CELLUFLEX CEF*; Epoxy Plasticizers ... *CELLUFLEX 21 and 23*; Four grades of flame-retardant Tricresyl Phosphate ... *LINDOL (low color)* ... *CELLUFLEX 179A (low specific gravity)* ... *CELLUFLEX 179C (general purpose grade)* ... *CELLUFLEX 179EG (electrical grade)*; Cresyl Diphenyl Phosphate ... *CELLUFLEX 112*; Dibutyl Phthalate ... *CELLUFLEX DBP*; Dioctyl Phthalate ... *CELLUFLEX DOP*; Triphenyl Phosphate ... *CELLUFLEX TPP*.

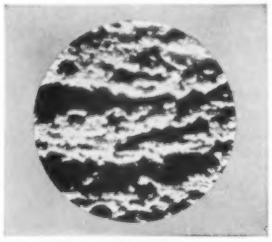
save on steel! save on acid! save on pickling costs!

. . . with Amchem Rodine!

Exhaustive comparison tests with competitive materials prove time and again Amchem Rodine's superiority in performance, with substantial savings in costs, acid and steel in the bargain.

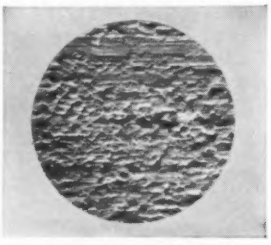
Amchem Rodine pickling acid inhibitors retard the attack of acid on the metal without lessening its capacity to remove scale. Not only do they save in metal and acid, but they reduce production costs and their efficiency improves the quality of the pickled product as well.

If you are now using an inhibitor in your pickling bath, you'll want to investigate the three way savings highly concentrated Amchem Rodine can effect. Find out now about this superior Amchem inhibitor development, ask about our full time technical and engineering assistance program, and check Amchem for service you can depend on long after the sale!



Effect of Uninhibited Acid

This microphotograph of a low-carbon sheet steel panel pickled in uninhibited sulfuric acid shows deep etching and the pitted character of the surface after 5 minutes in the solution.



Effect of RODINE-INHIBITED Acid

Panel pickled for 5 minutes in Rodine-inhibited sulfuric acid, then microphotographed. Only scale pockets and roll marks are visible; no pitting of the low-carbon sheet steel occurred!

Write for free Bulletin 1381 with handy selection chart showing characteristics of and uses for typical Rodine Pickling Acid Inhibitors, and Bulletin 1448 on Amchem Cuprodine, the simple non-electrolytic immersion process for producing bright, adherent copper coatings on carbon and stainless steels.

AMCHEM
AMCHEM RODINE

Amchem Rodine is another chemical development of **Amchem Products, Inc.**, Ambler, Pa. • Formerly American Chemical Paint Company Detroit, Mich. • St. Joseph, Mo. • Niles, Calif. • Windsor, Ont. / Amchem, Rodine and Cuprodine are registered trademarks of Amchem Products, Inc.

The *Mellowes* Co. puts KEYSTONE quality in a package

Unique lock washer merchandising wins customers . . . Keystone uniformity keeps them!

To sell lock washers, The Mellowes Co., Milwaukee, Wisconsin, puts them into new, functional "Job-Pak" packages and "Coin-Pak" rolls that reduce handling expenses, simplify counting and weighing, eliminate spilling and the mixing of sizes and permit speedier inventories.

To keep their customers "sold," The Mellowes Co. specifies Keystone Lock Washer Wire. This forward-looking firm makes 250 sizes of helical spring lock washers out of Keystone Wire. Here are some of the reasons why The Mellowes Co. prefers Keystone Wire:

- **Uniform diameter assures accurate dimensions when cold rolled into lock washer wire.**
- **Uniform structure completely spheriodized for easy coiling and close control of inside and outside diameters.**
- **Uniform chemical analysis and grain size provides consistent hardness in heat treating.**

The Keystone research metallurgists worked hand-in-hand with The Mellowes Co. to develop a special quality of wire for the manufacture of lock washers. The result has been a quality product manufactured at the lowest possible cost.

Your Keystone Wire Specialist and the facilities of our metallurgical department are at your service. Call us today to help solve your wire problems.

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE WIRE FOR INDUSTRY

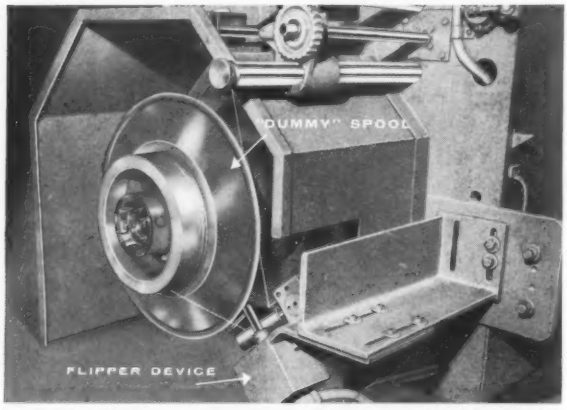
New Mechanism Eliminates Hard Starting Ends in Spooling of Resistance Annealed Wire

Syncro Liminator* Employs Auxiliary Spool and Transfer Device to Prevent Winding Unannealed Wire During Starting Periods

A new device designed and developed by Syncro Machine Company now makes it possible to prevent spooling hard wire ends during the initial acceleration period of wire drawing and annealing units.

During the acceleration period no electrical current is applied to the wire until the drawing and Resistoneal® equipment reaches a maximum operating speed. As a result a certain amount of hard wire is unavoidably delivered to the barrel of the spool.

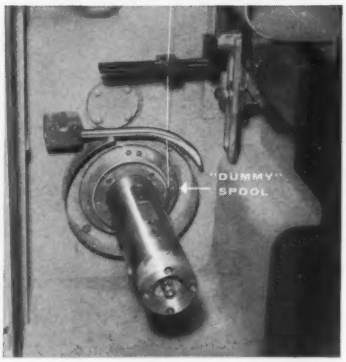
The new device, called the Syncro Liminator incorporates a flipper mechanism and auxiliary or "dummy" spool. Its use eliminates the unannealed wire problem, a condition often considered undesirable by wire manufacturers.



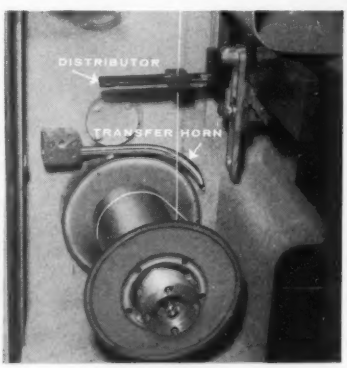
A. Syncro Liminator shown in operation on model DF Spooler. Wire passes under flipper roll onto "dummy" spool.

Illustration A shows a spool placed in its normal arbor position with the "dummy" spool attached to the end of the arbor. Wire is strung through the flipping device and onto the "dummy" spool until the annealer unit begins producing soft wire. At this point the flipping unit transfers the wire over to the normal spool barrel leaving the hard wire starting end behind on the "dummy" spool.

The Liminator shown in illustration A has been designed for continuous spooling of coarse and intermediate wire. A second Liminator model is also available for use in conjunction with light intermediate and fine wire spooling equipment. Illustration B shows the second model with its "dummy" spool located on the arbor drive plate and the transfer device in starting position. The regular spool is then placed on the arbor. The "dummy" spool operates as described above taking up hard wire until soft wire is furnished from the annealer. The transfer horn (illustration C) automatically deflects the annealed wire over the spool flange and onto the barrel, when distributor mechanism is set in motion through automatic electric control.



B. Second type Liminator for light intermediate and fine wire. Illustration shows "dummy" spool mounted on arbor plate and transfer horn in starting position.



C. Transfer horn guides wire from "dummy" spool over flange onto normal spool barrel.

For a detailed description and specification sheet on the Syncro Liminator direct your request to Syncro Machine Company, Dept. C, 611 Sayre Avenue, Perth Amboy, New Jersey.

*TRADEMARK APPLIED FOR

SYNCRO MACHINE COMPANY
Perth Amboy, New Jersey, U.S.A.
affiliated company: WINGET SYNCRO Ltd. Rochester Kent, England

SYNCRO®
Better Machinery for the Wire Industry

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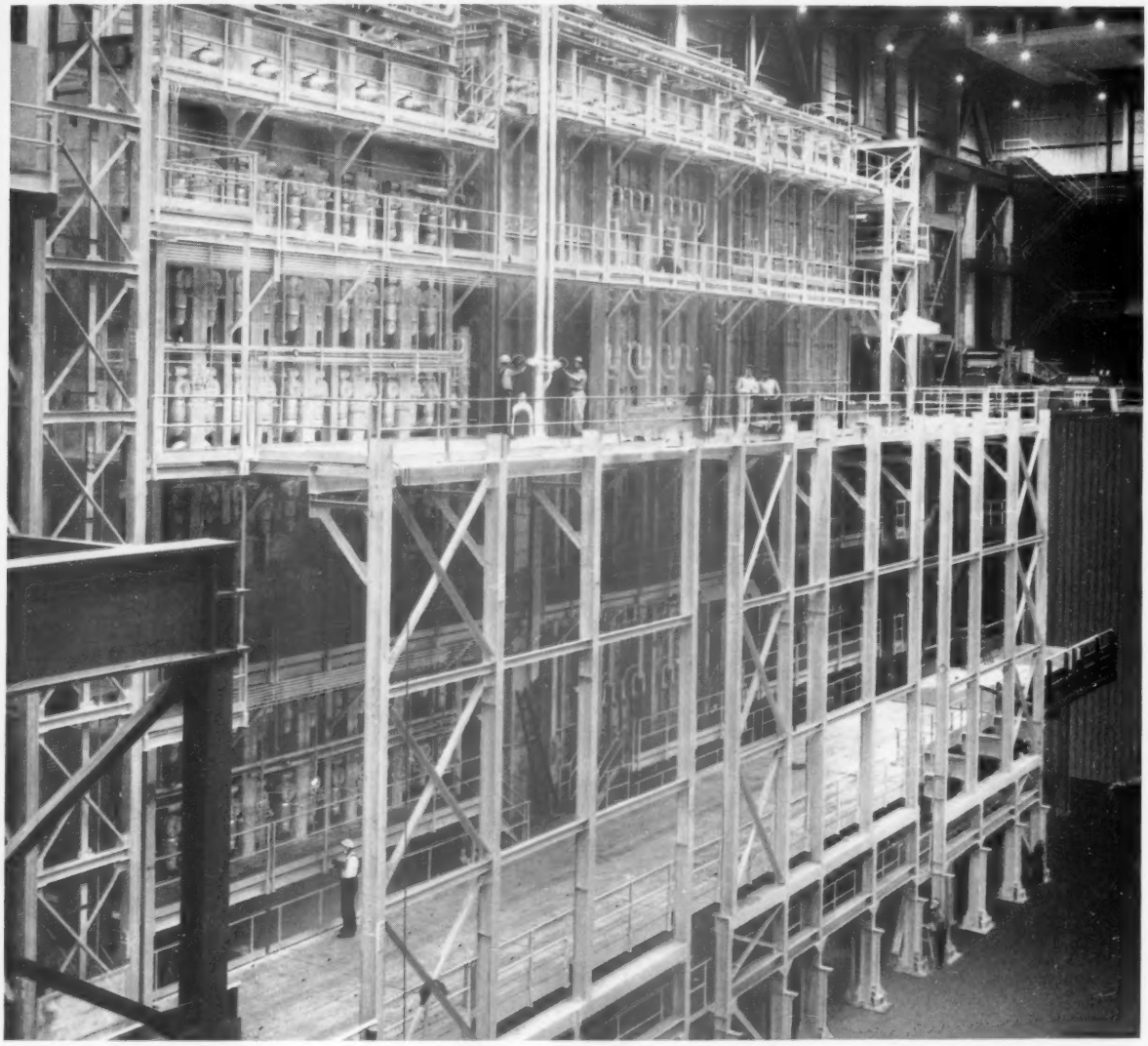
68 Tons of Steel Strip per Hour ...CONTINUOUSLY



World's Largest Strip Annealing Furnace

68 tons of steel strip are annealed every hour continuously in this furnace ... largest of its kind in the world.

The Sunbeam Equipment Corporation, a wholly-owned subsidiary of Sunbeam Corporation, is equipped to handle any furnace job from design right through to final installation. No furnace job is too large.

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ELECTRIC WIRE & CABLE SECTION NEWS

At its meeting on October 13, 1958, the Board of Directors of The Wire Association authorized the Section to hold a technical session in the Spring of 1959.

During the Annual Convention in Atlantic City, N. J., the Electric Wire and Cable Section Committee held a meeting at which Boston, Massachusetts, was decided upon as a desirable location for the meeting.

Urbain J. H. Malo, Technical Director, The Crescent Co., Pawtucket, R. I., was appointed Program Chairman, and the Statler Hotel, Boston, on April 29-30, 1959, has been decided upon as the time and place.

The Committee

The Men who comprise the Electric Wire and Cable Committee and who are responsible for the Association's service to this branch of our industry are:

Clement C. Lawson (Chairman)
Plant Facilities Engineer
Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

Harold W. Adams, Prod. Supvr.
Cable Div. Reynolds Metals Co.
6601 W. Broad St.
Richmond, Va.

David Barr, Plant Eng.
National Electric Products Corp.
338 14th Street
Ambridge, Pa.

Grover W. Brown, Mgr., Machinery Development
The Okonite Co.
Passaic, N. J.

G. E. Forsberg, Vice-President
Surprenant Manufacturing Co.
172 Sterling St.
Clinton, Mass.

Charles M. Fredrickson, Tech. Dir.
Southern Electrical Corp.
P. O. Box 989, Chattanooga, Tenn.

James S. Higgins, Plant Eng.
Walker Brothers,
Copper Div.
Conshohocken, Pa.

R. W. Higginbottom, Chief Cable Eng.
Triangle Conduit & Cable Co.
P. O. Box 711
New Brunswick, N. J.

Alexander A. Kerr, Supt.—Prodn.
Electrical Wire Div.
John A. Roebling's Sons Corp.
Trenton 2, N. J.

C. L. Kessler, Chf. Works Met.
Aluminum Company of America
P.O. Box 150, Massena, N. Y.

Alfred H. MacGillivray, Supt.
Collyer Insulated Wire Co.
249 Roosevelt Ave.
Pawtucket, R. I.

Urbain J. H. Malo, Technical Dir.
The Crescent Co., Inc.
Front & Central Ave.
Pawtucket, R. I.

W. R. Moyers, Chief Eng.
Wire Engineering Dept.
Western Electric Co.
P. O. Station B
Buffalo 7, N. Y.

J. C. Murray, Jr., Vice-President
Crescent Insulated Wire & Cable Co.
319 N. Olden Ave.
Trenton 5, N. J.

D. M. Schmid, President
Techalloy Co., Inc.
Rahns, Pa.

Philip H. Snyder, Plant Mgr.
Wire and Cable Div.
The Electric Auto-Lite Co.
601 Poplar St.
Hazelton, Pa.

H. S. Spaulding, Tech. Supt.
Kaiser Aluminum & Chemical Corp.
P. O. Box 671, Newark, Ohio

Roger T. Stafford, Project Engineer
Kennecott Wire & Cable Co.
Phillipsdale (Rumford 16), R. I.

Marshall V. Yokelson, Res. Met.
General Cable Corp.
Bayonne, N. J.

Further details will be reported as they develop.

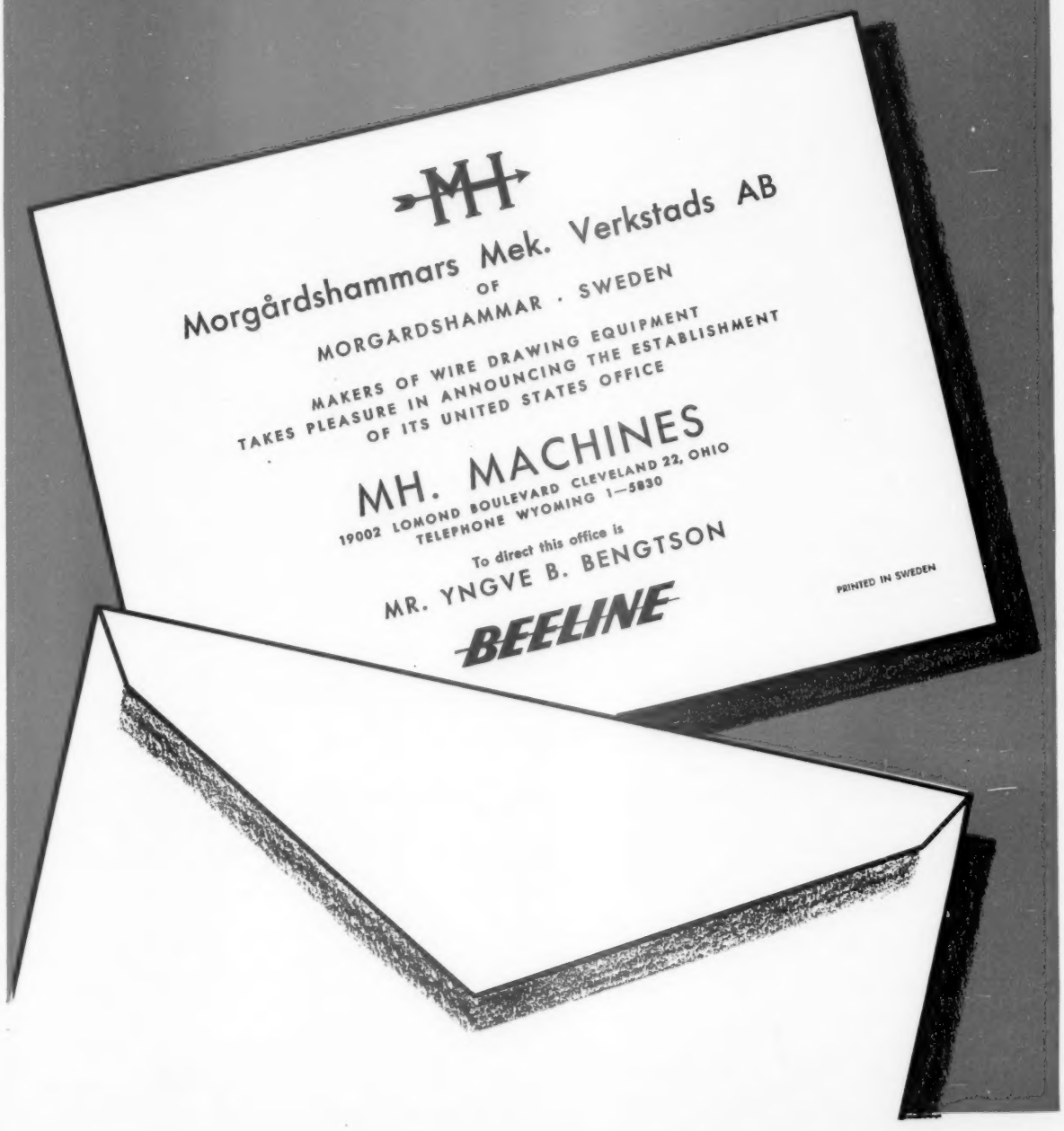
THE WIRE ASSOCIATION

RICHARD E. BROWN, *Executive Secretary*

453 MAIN STREET • **STAMFORD, CONN.**

An important notice

to the wire industry:



a profitable idea!

These curtain hooks are fabricated on a four-slide machine from Alcoa® Aluminum Wire . . . light, strong, corrosion resistant. They're good looking, can be anodized in blue, gold—various colors. If you use wire in your product, check into the many advantages of aluminum.

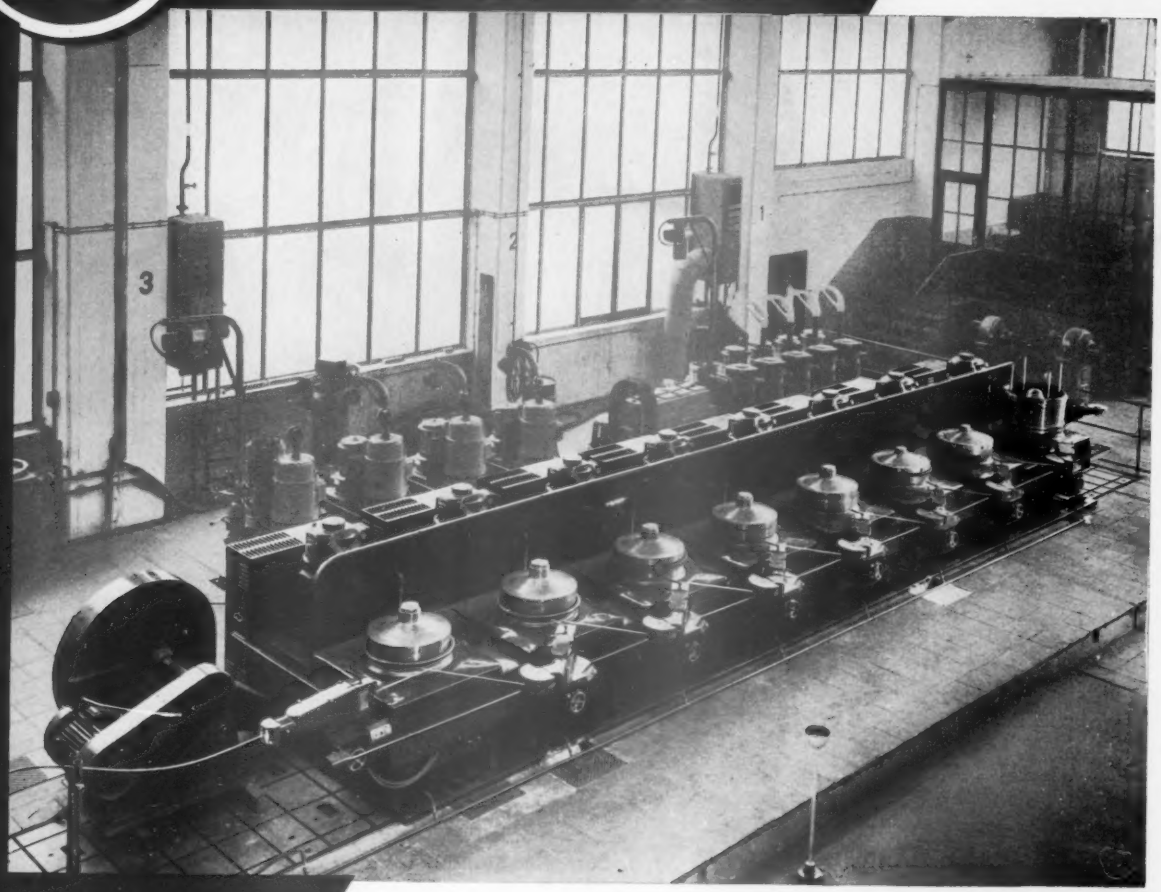
Alcoa has set up a special department to work with you on profitable new ideas, new uses for aluminum wire. For immediate action, write ALUMINUM COMPANY OF AMERICA, Wire Products Development, 1993-M Alcoa Bldg., Pittsburgh 19, Pa.

Your Guide to the Best In Aluminum Value

ALCOA ALUMINUM

ALCOA THEATRE • Fine Entertainment • Alternate Monday Evenings

HERBORN



HERBORN straight-through wire drawing machine

model G Ia with power selective alternating current drive, with air- and water cooling system, for the drawing of medium and high carbon spring wire with starting size from 3/8" diameter.

Please send us your inquiries, we shall be glad to submit suggestions and proposals

MASCHINENFABRIK HERBORN
BERKENHOFF & DREBES A. G., HERBORN/GERMANY

Sole Agent in USA:
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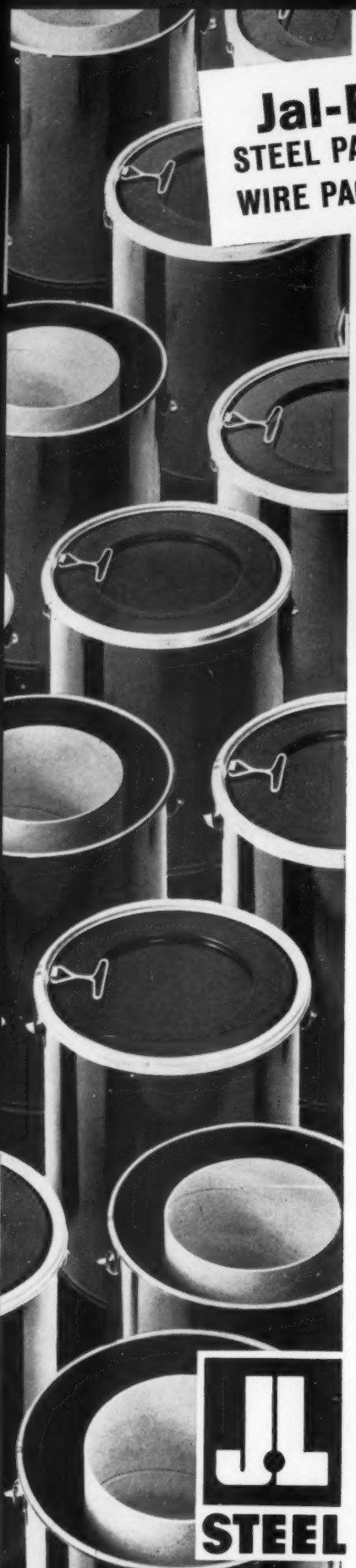
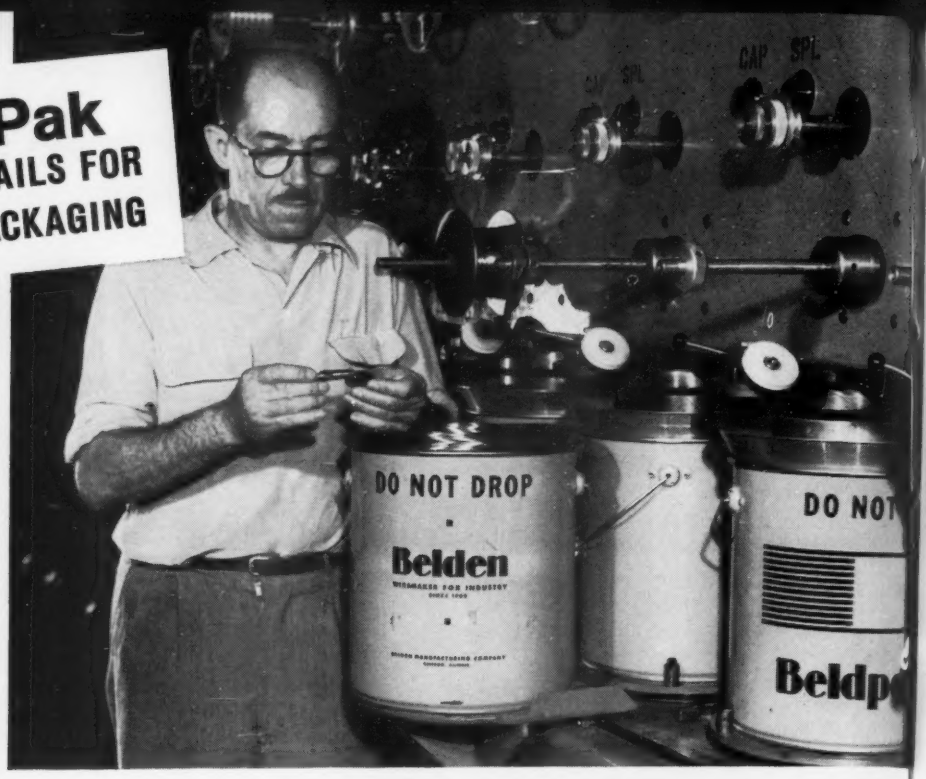


Jal-Pak
STEEL PAILS FOR WIRE PACKAGING



"J&L DISPOSABLE PAIL CUTS OUR WIRE HANDLING COSTS"

...states Belden Manufacturing Company

"These Jal-Pak pails eliminate costly spools and reels in wire handling," reports the Belden Manufacturing Company, Chicago. "There is no initial spool investment, return problem or involved bookkeeping." Belden uses the name Beldpak for Jal-Pak pails. They use them for 14 to 30-gauge wire in 100 pound quantities.

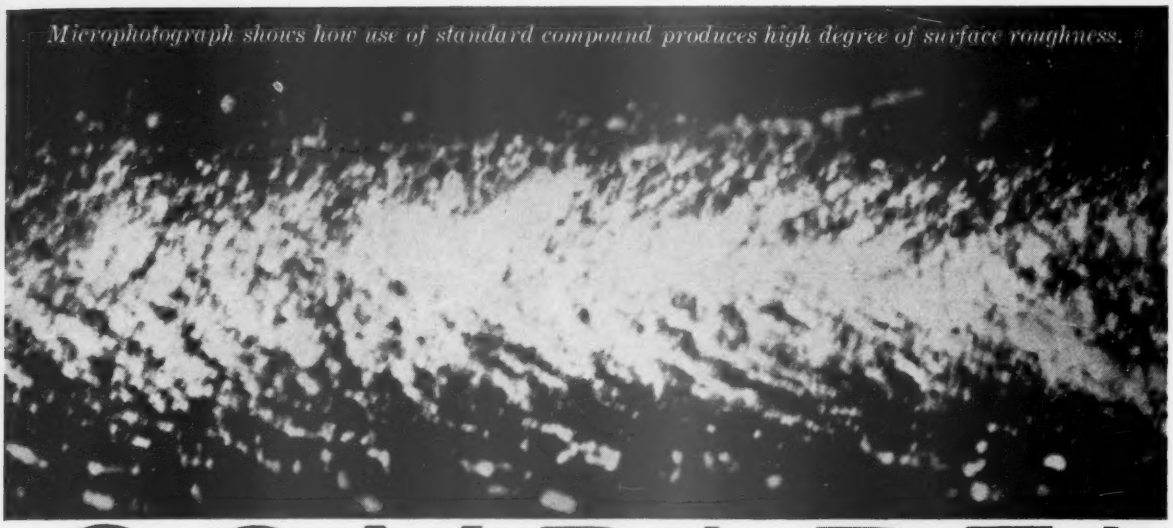
Jal-Pak pails, a unique Jones & Laughlin product, feature a specially rolled smooth side seam that prevents damage to wire and permits optimum winding speeds. You get the protection of steel in shipment and storage. The lower investment, no deposit, no return, save time and money in production operations.

Jal-Paks are service-proved in handling brass, copper, steel, aluminum, stainless steel, welding and soldering wires. For complete information on how Jal-Paks can help you increase production and sell more wire, contact your J&L Container Division representative or write direct to Jones & Laughlin Steel Corporation, 405 Lexington Avenue, New York 17, N.Y.

Belden Manufacturing Co., Chicago, utilizes machines that can handle 24 wires in four sizes with two coats of insulation and simultaneously reel them into 12 rotating 100-lb. Jal-Pak pails. No spools or reels are required.

Jones & Laughlin Steel Corporation
CONTAINER DIVISION
405 LEXINGTON AVENUE, NEW YORK 17, NEW YORK

J&L STEEL



Microphotograph shows how use of standard compound produces high degree of surface roughness.

COMPARE!

Improved surface finish is obtained when insulation is made from Monsanto Polyethylene 10.

FOR SMOOTHNESS

Monsanto's new natural polyethylene insulating compound, Monsanto Polyethylene 10*, promises improved surface finish in extruded primary insulation.

New Monsanto Polyethylene Insulating Compound (MPE 10) offers telephone cable manufacturers superior extrudability at high rates, along with the smooth surface finish that can reduce frequency of sparker failure during twisting and cabling operations. MPE 10—thoroughly tested in commercial applications—meets standard telephone cable requirements. Write for complete data to Monsanto Chemical Company, Plastics Division, Room 1256, Springfield 2, Massachusetts.

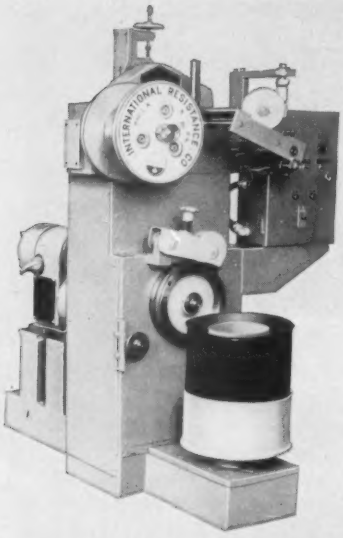
Monsanto

**Improved Monsanto Polyethylene 122531*

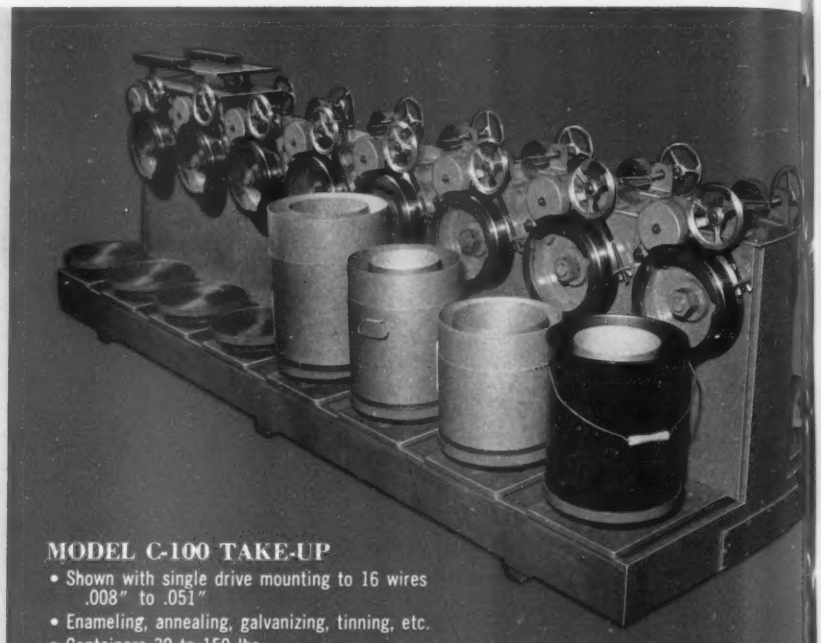
COULTER & McKENZIE

CONSTANT TENSION DRAW-PAK EQUIPMENT

FOR CONTINUOUS WIRE PACKING & DRAWING



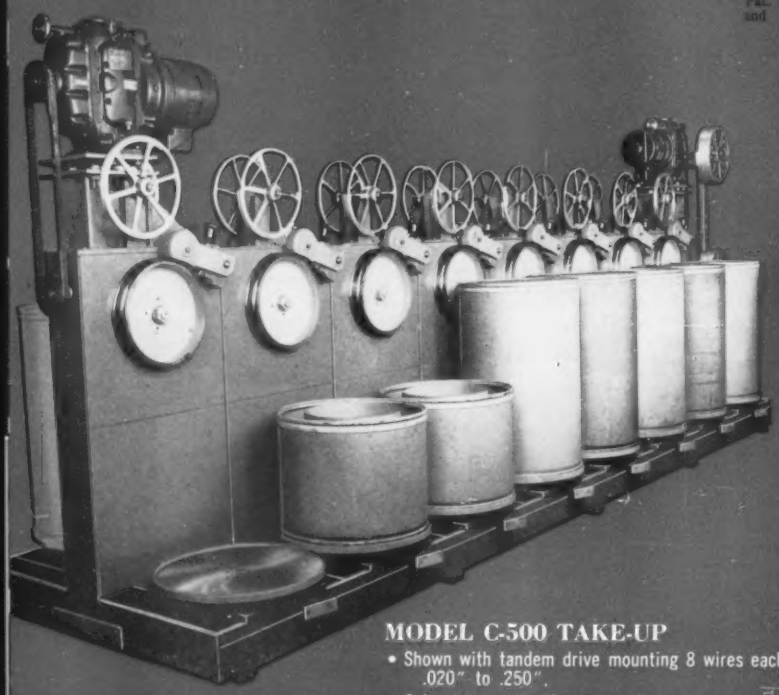
- Combination drum or spool take-up and rewinder.
- Shown for single wire.
- Adjustable for tension, pitch and amplitude of traverse.
- 12" spool shown. 30 to 150 lb. drums.



MODEL C-100 TAKE-UP

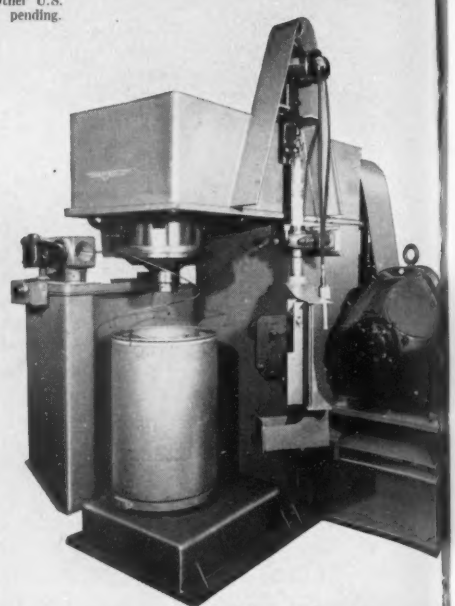
- Shown with single drive mounting to 16 wires .008" to .051"
- Enameling, annealing, galvanizing, tinning, etc.
- Containers 30 to 150 lbs.

Pat. No. 2,732,000. Other U.S. and foreign patents pending.



MODEL C-500 TAKE-UP

- Shown with tandem drive mounting 8 wires each side .020" to .250".
- Galvanizing, patenting, enameling, etc.
- Drum or adapter weights 200 to 1,000 lbs.



MODEL 138-A DRAW BLOCK

- Single draft wires .016" to .375"
- "Draw-cast" die box shown gives adjustable positive cast control. Also available in other sizes.
- Process adapters to order — drums to 1,000 lbs.

Your inquiry specifying the application which is of interest to you will result in prompt and courteous attention.

Barron & Crowther Ltd., Eastleigh, Hants, England. European Draw-Pak Licensee.

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THE COULTER & McKENZIE MACHINE CO., INC.

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The Wire Outlook

As we enter the new year it is interesting both to look back and to guess ahead.

Business in toto is back to where it was before the recession. The speed of recovery was little short of spectacular. Profits for the second half climbed sharply and dividends, with few exceptions, will be about the same as last year's. Retail sales were up from 1957 and, when finally tallied, may be higher than the past year. In fact, the recession ended so quickly, it is difficult to appraise all its ramifications.

The first half of the new year will probably show a steadily increasing tempo of business, but for the second half a somewhat slower pace is expected. 1959 business activities are not likely to reach boom proportions, but largely will be a getting back to normal, a normal that well may be precedent to a new boom in the years ahead.

In statistical terms, 1957's boom gave us a GNP of 445 billions. In the first quarter of 1958 it dropped to a low of 426 billions. For the last quarter of 1958 it had risen to 450 billions. By July of this year it may be 465 billions from present indications and in 1960 rise to 475. Some small degree of inflation will be reflected in these figures but for the most part the increase will be due to larger sales.

On the debit side is always the threat of war, the constant upping of demands by labor, the prospect of heavily increased spending for defense and bureaucratic operations and a larger volume of imported goods—some of which even now are a thorn in the side of many wire machinery manufacturers and wire mills. It is stated that imported wire goods were 50% greater in 1958 than in the preceding year.

The construction industry, a good consumer of wire and wire products, according to the Departments of Labor and Commerce, will rise in 1959 about 7% to a record 52.3 billion dollar volume, 5 billion over 1958. This includes both public and private construction projects, principally home and highway building, both of which are expected to be spurred by the continued rise in the Nation's output of goods and services.

Machinery sales, which were hard hit by the recession, are beginning to move up, the wire industry's suppliers being no exception. Wire mills in general, as noted previously, are operating at around 75% of capacity. The auto industry, which looked forward optimistically to 1959, is finding a satisfactory response to the new models. This has contributed to good business for those concerns who supply it with wire for mechanical and electrical applications.

Electric wire and cable manufacturers are doing a good volume of business productionwise, but there are many reports that price-cutting has reduced ability to make satisfactory profit showings.

Manufacturers' wire, high carbon spring wire and automotive spring wire are moving in increased volume and fastener orders are better than it was expected they would be a few months back. Upholstery wire is making a moderately improved showing. The wire branch of the steel industry, however, is not keeping pace with the general recovery.

The negative forces of business, almost without exception, have become positive forces on a widespread base. While there is so far no sign of a build-up in inventories, this may come if prices of rods and wire show any signs of being increased.

With the production index at a fifteen-month high, our industry can look forward to a better year. One forecaster who has been remarkably accurate with his predictions during the last decade states that for the next four years at least business will be moving steadily forward.

Edmund Duval Sickels
EDITOR

No substitute for experience.

For 50 years we've specialized in working with **companies who know** the importance of little things... companies who have found that a little thing like correct wire drawing powder can make a **world** of difference in the finish of a wire product... can increase die-life and prevent costly downtime.

During this 50 years, we've worked with customers in the development of new processes... processes that often waited for their perfection upon the performance, the dependability of an R. H. Miller lubricant or coating compound.

That's why our powders, greases and compounds have become a byword in the wire drawing industry. The men in charge of the nation's leading wire-drawing and processing plants have known and depended on R. H. Miller products for most of their working lives. **Their** experience has taught them that **there's no substitute for experience.**

50 years of specialization in just one field... That's experience. That's dependability. That's R. H. Miller Industrial Lubricants.

R. H. Miller Co., Inc., Homer, New York

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 34 JANUARY, 1959 No. 1

What The Wire Association Means To You — And What Is Ahead

by David Dwight Buchanan
Johnstown, Pennsylvania

THE MORDICA MEMORIAL LECTURE FOR 1958

The Association's Board of Past Presidents is charged with the duty of selecting each year a man to deliver the Mordica Memorial Lecture at the Annual Convention to honor and memorialize John Mordica, the Association's first president. The person to whom this invitation is extended is one who has achieved recognition in the industry for outstanding contributions to its advancement. It is the highest honor within the power of the Board of Directors to bestow upon a member of The Wire Association.

The 1958 lecturer, Mr. Buchanan, gave this lecture at the Annual Luncheon of the Association during the Annual Convention in Atlantic City, New Jersey, on October 15, 1958.

D. D. BUCHANAN

Mr. Buchanan retired on October 1, 1957, as Division Manager of the Union Drawn Steel Division of Republic Steel Corporation, after having served the steel industry for 54 years. His career with Union Drawn began in 1924 when he was named manager of the company's Beaver Falls, Pa., No. 3 plant. Six years later he was made Assistant General Manager of Union Drawn at company headquarters in Massilon, Ohio. He became Division Manager in 1938. He is a life member of the Iron and Steel Institute and a member of The Wire Association, of which last he has been a director for many years and of which he served as president during the years of 1944 and 1945.

It is indeed a great honor, as well as a truly great privilege to be invited to give the **John Mordica** Memorial Lecture for 1958. I feel this particularly because Mr. Mordica was a great pioneer in the wire industry. America has been built by the pioneering spirit which has been displayed initially in conquering the land, and subsequently in developing it industrially. In his quest for new knowledge in the wire industry, Mr. Mordica had an inquiring mind which was exemplified by his work on the basic aspects as well as the glamorous aspects of the wire industry, both in the production field and in the uses of wire. It is unfortunate that he could not have lived to see the many developments that have taken place in the last decade.

* * *

At nineteen previous Mordica Memorial Lectures, you have heard the story of his contribution and the formation of **The Wire Association**, which, with the help of **Richard E. Brown**, who is our present Executive Secretary, formed the nucleus of what today has grown to be one of the most helpful of the technical organizations. This was the foundation, and I know if he were here he would look with pride both on The Wire Association and the Wire Industry of the present.

* * *

Previous lectures have covered

IN MEMORIAM

JOHN MORDICA
1873-1937

this phase very thoroughly, but **John Mordica** was always thinking of the future—so let us look at what has developed from the foundation laid by him, as a leader, and many others who have also contributed to this industry.

★ ★ ★

When we look back on the wire industry, both the Ferrous and the Non-Ferrous divisions, there have been many long strides made in certain fields, particularly in the high speed machines, proper wire drawing compounds, and improved practices to withstand these speeds. These were things in the back of the mind of many leaders in the wire industry such as **John Mordica,** but it was due either to lack of engineering, finances, or availability of certain products that they were unable to develop the machines of their dreams. Today, we are not dependent on line shafting and inadequate power to produce the speed, and we can secure almost any type of control wanted for a given job.

★ ★ ★

True, we have developed machines with high speeds to increase the productivity and reduce the cost of actual drawing of wire, either Ferrous or Non-Ferrous. But have we looked beyond this point with the same vision and ingenuity on items that make up the total cost of producing a ton of finished wire? Over the years, not only have labor costs increased very considerably, but customers' demands have required services for which the proper extras have not been added. This has resulted from the desire of certain people to secure an advantage in the matter of competition. This, gentlemen, is still going on and will continue until the wire industry realizes it is in business to be paid for services rendered and the quality of its products.

★ ★ ★

Many of you here know you could not possibly have given the present day service 25 to 30 years ago to your customers, or the higher quality and control for a given demand, but here again, it all goes back to the improvement in the equipment, compounds, practices and handling equipment.

★ ★ ★

Sometimes it is well to review your past performance on costs to see what progress has been made in your own plant. I know you will find many surprising discoveries; do not treat these casually, but take a little time and think of what more could have been done had the same effort been applied to all problems concerning your product. Certainly it has been a job well done, but it is never good enough, so that 10 or 20 years from now you will not look back and say, "Why did I not apply more thought to the problem?" As you realize, today with the high speed equipment and facilities you will find your direct labor drawing cost is about one-third of your total cost. (This is taken from a representative wire mill cost.) The remaining two-thirds have been increased materially by this little service and that little service which has accumulated over a period of years.

★ ★ ★

The Wire Association started with a small group of men and has grown year after year to its fine and impressive stature. I think that each member should realize that it is an organization that is closely knit and very cooperative with all members. Credit should go to those who have carried out John Mordica's thoughts in later years, **Richard E. Brown** and **Ruth Spengel** and their staff. I think we should appreciate the fine personal contacts that are prevalent in **The Wire Association** which cannot be found in many other societies throughout the country. It is not too large and not unwieldy. The many services rendered to members throughout the year are of great value, and the amount of information dispensed through **The Wire Association's** office staff is tremendous.

★ ★ ★

I think I would be remiss if I did not express my observations over the many years on the growth of **The Wire Association** and what I consider has been one of the very important contributions to the close personal friendships that have been built up within the Association. I think the equipment builders and the suppliers have been most important in creating the atmosphere which exists. I know that the producers appreciate the fine spirit of having the opportunity of assembling at the various "get-togethers" that our suppliers have so kindly offered. I firmly believe these gatherings over the years have resulted in a more aggressive Association. There are many exchanges of ideas and it has built up a very fine fellowship which could not have existed otherwise. I feel we should appreciate the excellent spirit of cooperation of our suppliers.

★ ★ ★

I note over the past several years that the problem of securing papers, both in the Ferrous and Non-Ferrous groups, has been less difficult. I also believe there has been an improvement in the quality of the papers and of the discussions so that the meetings today are more informative. The interest of the members of the Non-Ferrous Division has increased materially in recent years so that the Ferrous group will have severe competition in the field of presentation of papers.

★ ★ ★

In looking over 1958, I know all of you have felt that business is off; and it has been, but the total business over the year will gross probably ten billion dollars over 1957. But needless to say we are always expecting increases each year. We must realize that tremendous capacities have been added to manufacturing facilities and this naturally decreases the percentage of operation on the basis of present day equipment.

★ ★ ★

The great build-up in manufacturing capacity has made 1958 the most rugged year competitively that we have seen since the years of the war. Everything is in ample supply and price advances are hard to put into effect even though wages will continue to rise and the squeeze on profits will intensify. This, in turn, will bring about

(*Please turn to page* 116)

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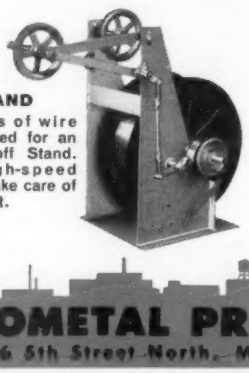

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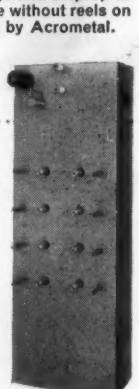

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Symposium on Shot Blast Cleaning of Rod October 14, 1958

MODERATOR

Dr. Walter G. Everling, Director of Research

American Steel & Wire Division

United States Steel Corporation

Cleveland, Ohio

Five papers were presented in this Symposium, which follow. At the end of the paper by Mr. White is a summary of the information brought out in the recorded discussions.

Descaling of Wire by Shot Blasting

Part I

Introductory Remarks on Mechanical Descaling in General

by Dipl. Ing. Heinz Berge, Works Manager

Westfaelische Union Aktiengesellschaft

für Eisen—und Drahtindustrie

Hamm (Westf.), Germany

A paper delivered at the Annual Convention of The Wire Association in Atlantic City, N. J. on October 14, 1958.

The author graduated from the Technical University of Hannover, Germany, in 1936. After years of wide experience and activity in the wire industry, in 1958 he was elected Vice President of Engineering and Production. He is also a member of the Board of Directors.

Technicians and experts in the iron and steel industry all over the world are confronted with two acute problems. These are the pollution of the atmosphere by dust and obnoxious gases, and the contamination of rivers and subsoil water by industrial acids and other injurious substances.

★ ★ ★

Whilst finding a solution to the first mentioned problem is primarily a responsibility of the Steel Producers, the necessity for revised practices of industrial waste disposal affects to an equal extent all divisions of the Steel Processing Industry. Throughout the various branches of the finishing departments—cold rolling mills, press and forging shops, as well as wire drawing works—the cleaning of steel from adherent scale has been effected in the past—and still is in the majority of cases—by means of acid pickling. The pickling wastes were often simply discharged into the rivers without any sort of prior neutralisation or acid recovery. In other mills a certain neutralisation was achieved by the addition of lime to the spent pickling liquor, the effect of which, however, was rather questionable.

★ ★ ★

This somewhat careless practice of industrial waste disposal has led, in the course of the years, to a serious pollution of the rivers, followed by a vast destruction of fish in these waters, and eventually gave rise to administrative intervention in the form of waste water control laws which, in the case of Germany, are expected to come into force with more drastic demands on 1st of April 1959.

★ ★ ★

Although to the Wire Industry, as an important consumer of acid solutions, the enactment of these laws means a revolutionary change in the preparatory treatment of the rod material the justification for the new laws cannot be denied when one comes across the following statistical data taken from a report by K. Mathesius, published in "Eisen und Stahl":—[1]

★ ★ ★

"Investigations carried out in the Ruhr area in 1952/53 revealed that some 31.5 tons of iron—equivalent to some 85 tons of ferrous sulphate—were discharged

1) "Stahl und Eisen" 1957, No. 20, page 1349/55.

daily into the river Lenne, a small tributary of the Ruhr. This amounts to a total of some 11,500 tons of iron and some 31,000 tons of ferrous sulphate respectively, per year. Since in the alcaline environment of the sewage waters the ferrous sulphate ($FeSO_4$) will react to form chiefly ferrous hydroxide and insoluble sulphates (for instance, plaster of Paris), enormous quantities of sludge have accumulated in the rivers which, in the case under review, amounted to about 20 million cu. ft. of sludge in a year."

* * *

Taking the size of an ordinary freight car at about 700 cu. ft. capacity, it follows that some 700 trains, consisting of 40 cars each, would be required to carry the above mentioned amounts of sludge deposits away!

* * *

In the struggle to overcome the stream pollution problem three different trends of development have been followed in Germany:—

* * *

a) The first way tried was to eliminate pickling wastes through the introduction of regeneration plants. This method, however, has as yet met with only limited success, because in most of the large wire mills in Germany, on account of the diversity of their drawing requirements (mild steel, high carbon steel and alloy wires) only high purity acids can mostly be utilised so that, owing to the complications involved, development in this direction has made but slow advance in Germany.

* * *

Moreover, a certain amount of uncertainty still exists, due to lack of experience, as to the value and practicability of the various systems and methods proposed (monohydrate, hepdahydrate or hydrochloric acid treatment). For all these reasons, the number of processing mills in the Ruhr district where regeneration plants are in commercial operation is still very limited.

* * *

b) Another approach to the problem of pickling wastes was to substitute the conventional pickling in sulphuric acid solutions by cleaning the rod in molten sodium hydride. Although procedures based on this principle are technically feasible, they have proved of little practical value for the handling of goods in mass production, on account of the prohibitive cost involved.

* * *

However, with all pickling processes, the conventional acid pickling, or salt bath cleaning, there still remains the unsolved problem of how to dispose of the residual acids or the rinsing waters. Even if in a thorough regeneration process up to 85 pct. of the contaminating substances are recovered the remaining 15 - 20 pct. of residual acid which are washed away with the rinsing waters constitute quite a headache. The acid content carried in the rinsing waters is generally far in excess of the permissible rate laid down in the new laws.

* * *

c) Recognition of the difficulties associated with chemical cleaning prompted the wire experts after World War II to devote their attention to the principle of mechanical descaling. As a first step in this direction the system of descaling rod by means of bending was taken up and thoroughly investigated which, in recent years, has been widely accepted in practical mill operation. The process of bend cleaning is, no doubt, the most economical of all, because it can be worked in line with wire drawing in one continuous operation.

* * *

Through compatible means of postcleaning treatment, good results have recently been achieved in the bend-cleaning of the ordinary industrial qualities. Taking the situation for 1957, approximately 18 pct. of the entire rod consumption in the Federal Republic undergoes cleaning by bend-descaling, which comes to about 20-25,000 tons of rod per month. This fairly high portion refers, at the moment, almost exclusively to low carbon rod, chiefly the ordinary basic bessemer qualities. The increased use of the bend-cleaning technique in wire mills has resulted in a corresponding reduction in the consumption of sulphuric acid by about 400 tons per month and in the same way the formation of ferrous sulphates has dropped by about 800 tons per month.

* * *

Development in the field of bend descaling is still going on, particular attention being given to the question of improved postcleaning conditions. It may be reported in this connection that the application of rotating steel brushes has produced good results in our works. Bend-descaling, as it would appear from our own experiences, has its main field in the cleaning of common grade wires to be reduced in 3 or 4 drafts, or less, to finished sizes, without subsequent surface treatment, as zinc or tin coating.

* * *

d) Mechanical descaling by Shot Blasting is of a much later origin, the first experiments in this line having been initiated in Germany as recently as only 5 to 6 years ago. To-date three different shot blasting procedures are already in use:—

* * *

In the first case a plurality of wires, varying in numbers, are cleaned in continuous operation by the effect of an abrasive stream being thrown sideways with tangential impact on the wires. A production plant of this design has been in operation in the works of Westfaelische Union Company since early 1956. The specific experiences gathered in connection with this plant will be the topic of my successor's discussion in the next part of this paper.

* * *

Another method of shot cleaning consists in the blast treatment of rod in coil formation. When running the stock through the blast unit the bundles are opened out sideways and simultaneously made to rotate around their centre. Having as yet had no experience with this particular system we are un-

(*Please turn to page* 114)

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Descaling of Wire by Shot Blasting

Part II

Recent Experiences in Shot Blasting Practice

by Dr. Ing. Hans Krautmacher
Chief of Experimental Station
Westfaelische Union Aktiengesellschaft
für Eisen—und Drahtindustrie,
Hamm (Westf.), Germany

Description of a Plant

Since early 1956, a Wheelabrator plant for the mechanical descaling of wire rod by means of shot blasting with cut wire has been in operation in the Hamm works of the Westfaelische Union Company, Hamm, Germany.

★ ★ ★

Shown in Fig. 1 is a plan and elevation of the entire shot blasting line, which is accommodated in a large rod store house. The line has an overall length of some 252 ft., the major part of which (180 ft.) is occupied by the payoff reels and the takeup frame. The rods run from conventional payoff reels (Fig. 2) arranged in parallel across a straightening device, then an alignment frame (Fig. 3) and so into the shot blasting unit.

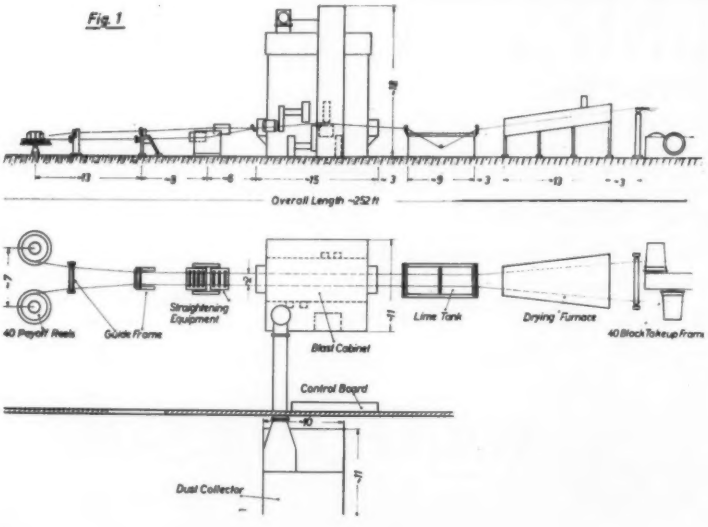
★ ★ ★

DR. HANS KRAUTMACHER

A paper delivered at the Annual Convention of The Wire Association at Atlantic City, N. J., on October 14, 1958.

The author graduated from the Technical University in Aachen, Germany, in 1951 and since then has been active mainly in wire research development work. He now is the head of the Research Center of his company and is a member of The Board of Directors.

Fig. 1



The actual blast cabinet is fitted with 4 blast wheels of the type as illustrated in Fig. 4.

★ ★ ★

After leaving the blast chamber, the cleaned rods are run through a steam heated lime tank (Fig. 5) and finally dried in a drying furnace. The takeup frame is designed for 20 spindles on either side, the spindles having a diameter of about 34 inches.

Fig. 2. * * * * * * * *

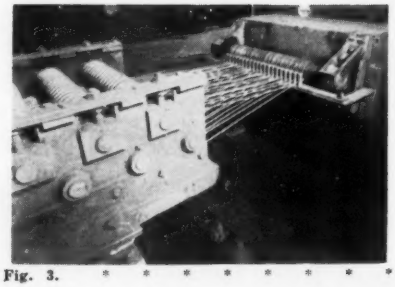


Fig. 3. * * * * * * * *

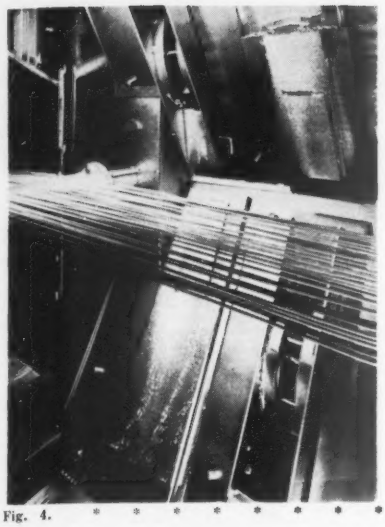


Fig. 4.

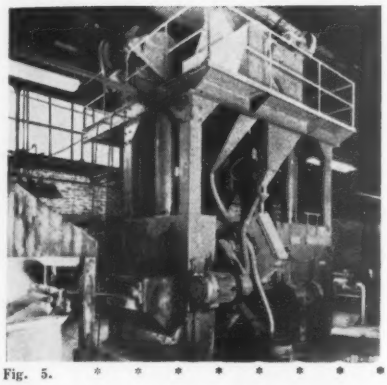


Fig. 5.

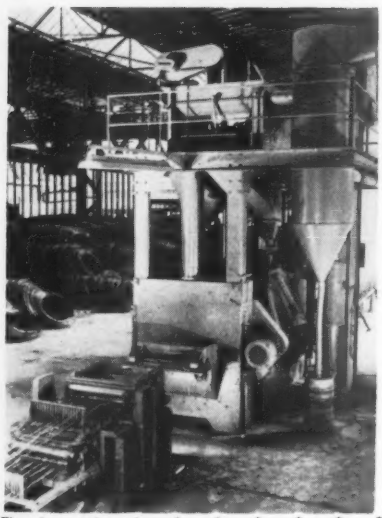


Fig. 6.

The entire plant (Fig. 6) is operated by a crew of 5 men, one of whom tends to the control board, while the remaining 4 are in charge of loading rod bundles and welding coil ends. Bundle weights range between 660 and 730 lbs., and their lifting is accomplished by means of crane hoists.

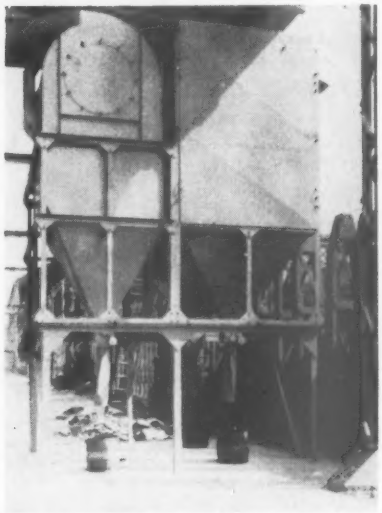


Fig. 7.

The dust collector shown in Fig. 7 is placed separately outside the warehouse, in the open. This arrangement was made in order to keep the work place dustfree and also as a safety measure, in view of the inflammable nature of fine iron dust.

★ ★ ★

The equipment as described above represents the layout of the plant in its present final stage of design. During the first 18 months of operation, a number of improvements were added to the system with the aim of establishing maximum cleaning conditions. These early developments have been reported upon in "Stahl und Eisen."[1]

Design of the Blast Cabinet

In Fig. 8 is shown a cross sectional view of the blast cabinet. 40 strands of rod, arranged in parallel and level with each other, are fed into the blast room, where they are guided by means of 3 profiled transversal rollers. The four blasting wheels are located with each other in such a way as to ensure an optimum shot blasting effect on the wire over the entire wire surface. Propelled by the wheels at a rate of 2200 to 2300 rpm, the abrasive is thrown against the passing rods at a speed of 260 ft/sec. The arrows shown in this figure indicate the direction of abrasive circulation in the machine.

Characteristics of Shot and Cleaning Performance

The quantity of shot circulated in the system amounts to some 9000 lbs. of cut wire, the individual wheels each being capable of blasting from 450 to 550 lbs. of shot per minute. It thus takes 5 to 6 minutes for the entire charge to be circulated in one cycle.

★ ★ ★

The shot material used is cut wire produced in our own works, of the quality "Spezial" .015 in. diameter, having a tensile strength of 230,000 to 260,000 p.s.i. Initially employed was cut wire of the same size, but with lower tensile properties (143,000 to 170,000 p.s.i.), until in a number of trial runs on a Wheelabrator pilot plant it was found that the resistance to abrasion of the harder material was markedly higher than that of cut wire of the lower tensile order. The harder quality has been in use ever since and in over two years of shot blasting practice has proved very satisfactory.

★ ★ ★

The graph in Fig. 9 refers to conditions in the first year of operation up to July 1957. The two curves shown indicate the theoretical capacity per wheel hour and the effective output of the plant, or tonnage cleaned per man hour, respectively; the curve below stands for the shot consumption during this period. The somewhat erratic results recorded for 1956, as reflected by the pattern of the curves, are to be ascribed to variations in operating speeds or in strand numbers, as they were alternately tried in the initial period of operation.

★ ★ ★

In Fig. 10 are shown the same kind of curves as in Fig. 9, this time, however, based on results registered from January 1957 until July 1958, and compiled at quarterly instead of monthly intervals.

1) E. Jaenichen, A. Duphorn, H. Krautmacher, W. Puengel. "Stahl und Eisen" 77 (1957) p. 1785/95

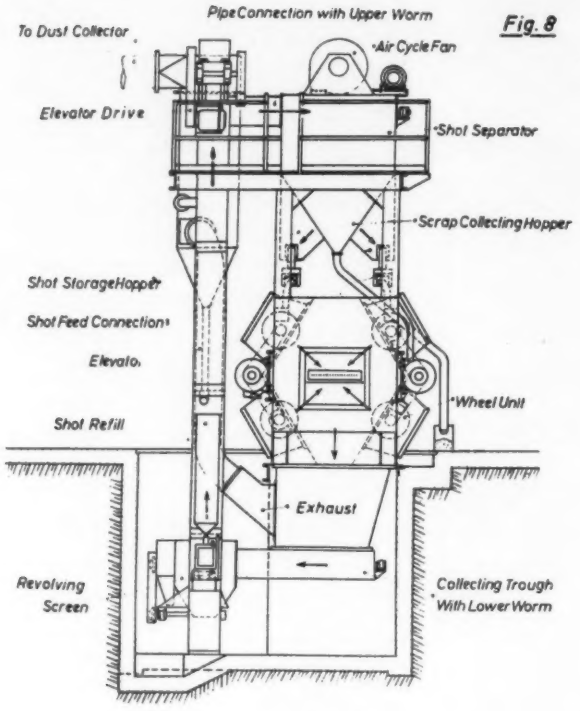


Fig. 8

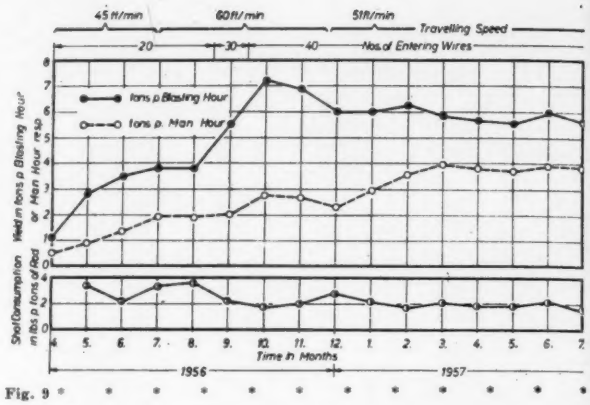


Fig. 9

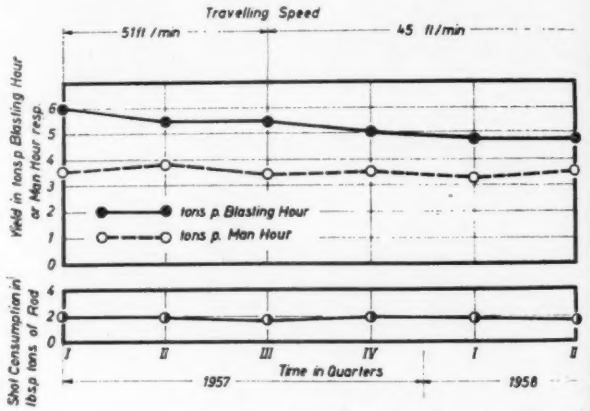


Fig. 10

It will be seen from the fairly steady course of the second set of curves that conditions have now become more or less stabilised, the shot consumption having been held at almost the same level. The reduction of the travelling speed from the original 51 to the present 45 ft./min. which, as will be noticed, was adopted in the autumn of 1957, was a deliberate measure introduced with the object of obtaining a higher degree of cleaning intensity, and a secondary benefit derived from the lower speed was that one of the operators could be dispensed with. During the last 18 months the plant has worked with an efficiency ranging between 72 and 75% and during the same period of time an average shot consumption of 1.8 to 2 lbs. per ton of rod, using rod sizes of .20 to .24 in. dia., has been recorded. These figures may be claimed as the ultimate values to be attained on this particular line.

* * *

An additional word may be worth while, at this point, to stress the importance of a proper positioning of the blasting wheels in relation to the travelling stock, because this has been found to be one of the major conditions for the best possible blasting job being performed at minimum cost. Blast stream checks are made at regular intervals, in order to ensure as accurate a control as possible of a uniform and properly directed blast flow. In Fig. 11 are given examples of how the blast stream should be correctly directed, and also of two wrong applications.

Summary of Earlier Testing and Experiences

The next section of my paper is devoted mainly to the discussion of a variety of tests, more recently conducted, investigating the behaviour of blast cleaned mild steel wires in Zinc Coating applications, and next the possibilities of adapting the process to the cleaning of High Carbon wires. Before I enlarge on these studies may I be allowed to recapitulate in brief the results of our earlier shot blasting activities on mild steel rod, as published in "Stahl und Eisen," whilst also including some of our more recent findings.

Removal of Scale

Comparative tests were conducted on mild steel wires of Basic Bessemer or Open Hearth commercial quality, that had been mechanically cleaned by shot blasting and wires descaled by bending without subsequent chemical treatment, and in all of them was disclosed an undeniable superiority of the shot blasting process over the bend-cleaning technique, in terms of cleaning intensity. Whilst the wires cleaned by bending carried from .05 to .08 pct. residual scale, the traces found on the shot blasted wires were only .01 to .02 pct. Acid pickling was found to produce absolutely scalefree surface conditions, but the process, on the other hand, involves a loss of base metal, which, in our tests, worked out at approximately .11 to .20 pct., due to acid reaction. In a monthly production of, say 10,000 tons or so, these pickling losses will amount to some 20 tons of steel and thus constitute quite a considerable economic factor.

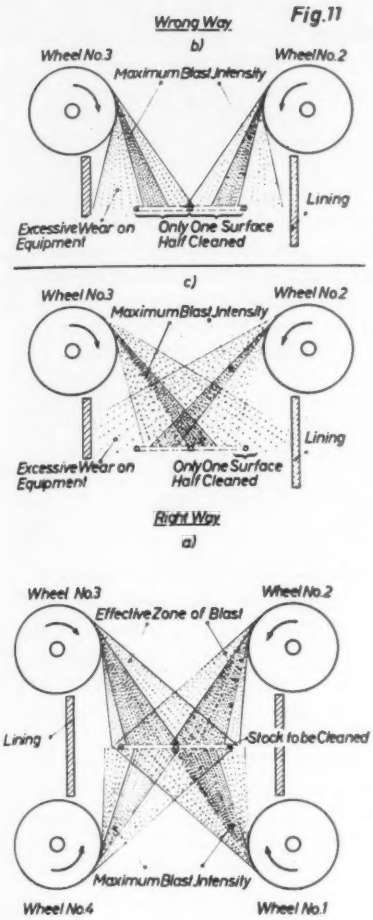


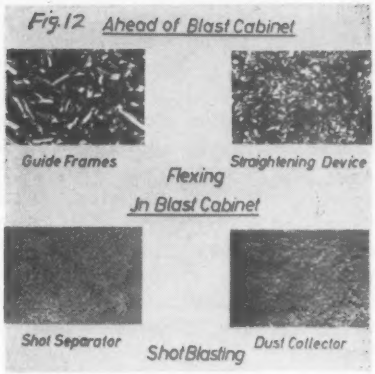
Fig. 11

It has been established by Eisenhuth[2] in his studies on descaling by bending that the cleaning by mechanical means works with the greatest success on wires carrying a scale which predominantly consists of iron monoxide. This can be claimed to be equally true with regard to the shot blasting technique. An FeO content of 75 to 80 pct. or more is considered a suitable percentage to obtain a satisfactory scale removal job.

* * *

In Fig. 12 are shown the various grades of scale breakdown as it is step by step dislodged from the wire on its passage through the shot blasting line. Prior to the actual blast operation, 60 to 70 pct. of the scale is usually cracked off already, as a result of the flexing sustained by the wire (guide frames) and in particular the severe deformation to which it is

2) "Stahl und Eisen" 77 (1957) p. 323/34.



subjected in the straightening apparatus. A further descaling effect results from bending the wires for alignment just in front of the blast unit. Quite a valuable descaling job is performed at these various points of deflexion, which all assist in relieving the final shot blasting work.

Die Wear

The best criterion of the efficiency of a scale removal process is Die Life in subsequent wire drawing. From our own mill experiences during the last two years the following conditions have become evident:—

* * *

Comparing the respective performance of shot blasted wire and wire cleaned by pickling, die wear in connection with the former, depending upon the number of passes, is about 10-20 pct., sometimes up to 40 pct. higher than when drawing acid cleaned wire. In reducing rods of .22 in. dia. in 5 holes down to .078 in., at speeds of 6.2 ft./sec. at the first and 26 ft./sec. at the final die, the corresponding figures for frequency of die replacement are at every 40 to 50 tons for acid cleaned wire and about 30 to 40 tons in the case of the blast cleaned material.

* * *

Blast cleaned wire, on the other hand, compares very favourably with wire cleaned by bending and in our tests has, in fact, proved superior over the latter in regard to draw die performance.

Surface Conditions

In Figs. 13 and 14 are shown various surface conditions on basic

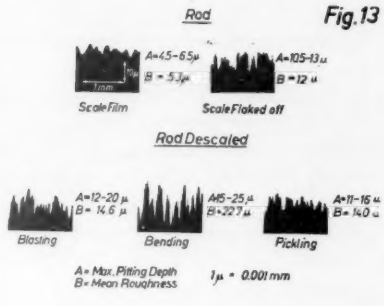


Fig. 13

Fig. 14

bessemer wires. Fig. 13 represents profilograms recorded by means of a Forster-Leitz roughness tester, 50 times enlarged. It will be noticed that the average surface roughness of blast cleaned wires is more or less of the same order as that of pickled wire, whereas the average roughness on wires cleaned by bending is 50 - 60 pct. higher. Similar results were established by metallographic testing (Fig. 14).

Lubricant Consumption

From the data collected in two years of shot blasting practice it can be stated that, in keeping with the similar surface texture on acid cleaned and shot blasted wires, there is practically no difference in the amount of drawing lubricant consumed in subsequent wire mill processing. The consumption, in both instances, can be averaged for about 1.3 lbs. per ton of wire drawn.

Mechanical Properties

In Fig. 15 are shown test results established on the bending and tensile properties of wires of ordinary basic bessemer quality drawn in 5 passes from .22 to .077 in., identical to an area reduction of some 88 pct. (mean values taken from 40 tests each for both test

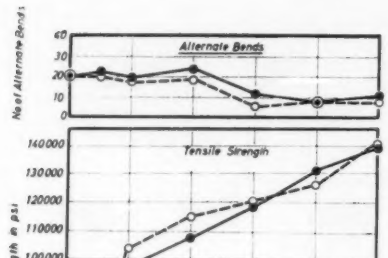


Fig. 15

categories). The respective tensile curves for blast cleaned and pickled wire are but little at variance, the small divergences lying within the normal scatter range, and also the number of reversed bending registered for both wire groups have been found to be the same.

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It may be of interest, in this connection, that in subsequent cold heading applications tool life, as well, has proved to be practically the same when handling blast cleaned as acid cleaned wires.

Zinc Coating Applications

It can be reported, generally, that no anomalous phenomena or complications of any sort have shown up in the two years of operational practice in the hot dip galvanizing of abrasive cleaned wires; this refers to both the regular grade and the heavy grade coating processes.

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In order to provide more scientific background for the conditions encountered in service observations, specific tests were carried out on a number of wires drawn from pickled rod and from shot blasted rod. The chemical composition of these wires is shown in Table 1.

Table 1

Wire Quality		C %	Si %	Mn %	P %	S %	N_2 %	Cu %	Cr %
Open Hearth	stdd	03	traces	31	016	042	004	21	04
" "	extra	02	"	05	018	018	006	06	01
Basic Bessemer	stdd	04	"	43	066	031	016	10	04
" " "	extra	04	"	40	052	044	010	22	04

★ ★ ★

Rod coils were split in two halves, of which one lot went to the pickle house and the other to the shot blasting station. Wires were then drawn from .234 in. rod diameter to .117 in. finished size (75 pct. reduction of area) and subsequently hot dipped, each lot, under like conditions for heavy grade zinc coating. 10 test specimens of each were taken from both wire groups and a number of tests carried out to determine the respective properties of the zinc coatings, such as thickness and structure of the zinc layer, its uniformity and adherence to the base wire. (Preece test and wrapping test around one, four and ten times the diameter). The results obtained in all these tests were identical for both wire groups and it was thus clearly demonstrated that the depositing of zinc by the hot dip process works with equal success and efficiency on blast cleaned wires as it does on the conventional acid pickled material.

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It is to be understood, by the way, that acid pickling, in the terms of this paper, should not be confused with the normal practice of running the wires through an acid wash, just ahead of the spelter bath, as is invariably done with all our wires ready for galvanizing.

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Up to this point the effects of shot blasting on low carbon rod only, has been discussed and, in fact, the Wheelabrator plant operated in the works of Westfaelische Union Company is still utilised solely for the handling of mild steel rod. However, in order to study the possibilities of applying the process with equal success to high carbon wires as well—as rod or patented—extensive experiments have been made for several months under normal service conditions. It is these which form the subject of the following report.

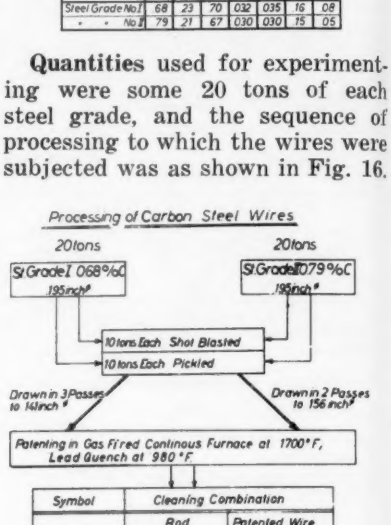
Tests on High Carbon Wires

Steel grades used and test procedure. Rods were selected from two different steel grades, with carbon contents of .68 and .79 pct. respectively (hereafter referred to as Steel Grade I and II). The full analysis of these wires is listed in **Table 2.**

Table 2

Wire Quality	C %	Si %	Mn %	P %	S %	Cu %	Cr %
Steel Grade No I	68	23	70	032	035	16	08
" " No II	79	21	67	030	030	15	05

Quantities used for experimenting were some 20 tons of each steel grade, and the sequence of processing to which the wires were subjected was as shown in Fig. 16.


Processing of Carbon Steel Wires
20tons
20tons
St Grade I 068%C
195inch
St Grade II 079%C
195inch
10 tons Each Shot Blasted
10 tons Each Pickled
Drawn in 3 Passes to 141inch
Drawn in 2 Passes to 156 inch
Patenting in Gas Fired Continous Furnace at 1700°F, Lead Quench at 980°F
Steel Grade I
In 7 Passes (40 87%)
Drawn to 0507 inch
Steel Grade II
In 5 Passes (40 75%)
Drawn to 078 inch

Symbol	Cleaning Combination	
	Rod	Patented Wire
A	Shot Blasted	Shot Blasted
B	Pickled	Shot Blasted
C	Shot Blasted	Pickled
D	Pickled	Pickled

Fig. 16

Of both groups in rod condition, one half was cleaned by shot blasting and the other half by pickling. After rod breakdown to the usual patenting size and subsequent patenting of the wires in the customary way (strand furnace followed by a lead quench), each lot was again split in two halves and the two cleaning processes, shot blasting or pickling, alternately applied to these so that, in the end, we had 4 test lots in either steel category, weighing 5 tons each, on which the following cleaning combinations had been tried:—

(a) blast cleaned (patented) blast cleaned
(b) pickled (patented) blast cleaned
(c) blast cleaned (patented) pickled
(d) pickled (patented) pickled

★ ★ ★

Pickling was done under normal conditions and the wires earmarked for blast cleaning (4 at a time) were run through the line together with the ordinary mild steel production, equally distribu-

ted over the whole width of the cleaning stock, in order to eliminate any hazardous influence which might arise from the respective position of the test wires in relation to the blast stream. Of the data collected for these wires the average was finally used in our comparisons. Travelling speed in all shot blasting applications was 45 ft./min., the normal speed of the line. Whether or not the proportional amount of shot used for cleaning the wires under study was different from the normal consumption, was difficult to define, in view of the comparatively small volume of the test wires in comparison with the stock in total. This point, therefore, must be left unconsidered.

★ ★ ★

In the blasting performance as such no difficulties of any sort have been encountered with any one of the test lots, neither on the rods of both steel grades, nor on the wires after patenting. In fact, the patented material, due to the troublefree payoff of the coils, was found to run with particular ease through the line. Coil weights in all cases were about 530 lbs.

Table 3

Steel Grade No	Wire Condition	Treatment	Scale Removal in %	Surface Condition	Scale Composition
I 0.08% C	Rod	a Laboratory	0.85 %		
		b Shot Blasting	0.84 (+0.01)	Fairly Clean With Scale Particles	69% FeO 31% Fe_3O_4
		c Pickling	0.85 (+0.10)	Very Clean	
	Patented	(Mean Value)	0.33	Max Cleanness After Blasting and Pickling	~ 100 % FeO
II 0.79% C	Rod	a Laboratory	0.73		
		b Shot Blasting	0.71 (+0.02)	Fairly Clean With Scale Particles	70% FeO 30% Fe_3O_4
		c Pickling	0.69 (+0.16)	Very Clean	
	Patented	(Mean Value)	0.38	Max Cleanness After Blasting and Pickling	100 % FeO

Scale conditions. In Table 3 are shown the comparative data recorded for percentage of scale removal, surface conditions after cleaning, and the composition of scale secured from metallographic screening. Laboratory testing was carried out on 4 samples each taken from 10 coils in each test category, and the figures quoted represent the respective averages from 40 individual tests. The amount of scale removed was measured on both the blast cleaned and pickled lots by weighing the entire charge before and after cleaning, allowing for an amount of .15 pct. of remnant lime from coating, which figure had been assessed beforehand in separate testings. In view of the very thin layer of scale present on the patented wires no scale determinations were made except for the laboratory method. The amount was less than .40 pct. and consisted almost entirely of iron monoxide (FeO).

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Comparing the results established on the undrawn rod it will be noted that on both steel grades shot blasting provided a practically 100 pct. cleaning performance. The small traces of residual scale measured (.01 - .02 pct. or 3, 5 - 7 ounces per ton of rod) are undoubtedly attributable in the main to inaccurate measuring (scale deficiencies). On visual inspection, the surface of the shot blasted rod would be called positively clean. It can be said, in general, that the blasting process applied to carbon wires in rod condition, gave good cleaning results, which would seem to be chiefly due to the comparative brittleness of the scale layer on both steel grades (70 pct. FeO).

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The pickled wires tested had perfectly scalefree surfaces, but here again, the well-known metal losses, the inevitable evil associated with pickling, were registered which, on the wires under test, ranged between .10 and .16 pct., or 2.2 and 3, 5 lbs. per ton of wire.

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Die performance. This very important factor was assessed in our tests in terms of tonnage drawn to produce a die bore widening of .01 mm, by evaluating the recordings taken after each pass over the entire test charge. Within the two steel grades results were more or less scattered. The averages have been entered in Fig. 17, thus illustrating the mean die performance over the entire processing range, from rod to patenting, and the final drafts.

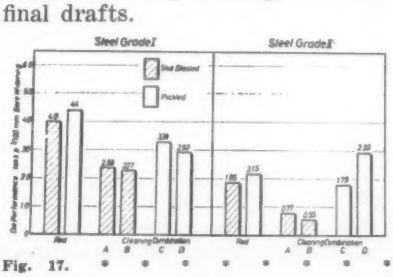

Fig. 17.

For grade I steel rod, when reduced in 3 holes from .206 to .14 in. intermediate size, the results obtained for both the pickled and the shot blasted wires were not essentially at variance. Die performance in connection with the pickled rods was about 10 pct. better than that observed on the shot blasted material.

★ ★ ★

In redrawing the patented wires in 7 passes to finished size (.05 in.), practically no difference was noticed, in terms of die performance, between the blast cleaned/blast cleaned and the pickled/blast cleaned categories, nor between the blast cleaned/pickled and the pickled/pickled lots. However, on the patented wires cleaned by pickling as opposed to the equivalent wires cleaned by shot blasting, the average die performance measured was 40 pct. higher. It can be stated, in general, that the rate of die wear is essentially influenced by the cleaning treatment ultimately applied before drawing.

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In the case of steel grade II, die performance, on the whole, was a good deal less satisfactory than was found on the grade I wires. This was particularly so in connection with the wires shot blasted after patenting, whilst on the wires having undergone acid cleaning as rod and after patenting, die performance was absolutely satisfactory.

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Lubricant consumption and surface roughness. Fig. 18 illustrates the amount of lubricant used in drawing the various test groups, expressed in lbs. per ton of wire drawn. Lubricant consumption for the shot blasted wires was greater than for the equivalent pickled

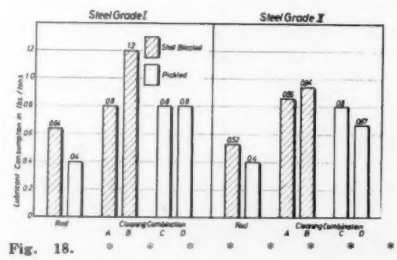

Fig. 18.

wires, although, on the whole, not outstandingly so, except for steel wires grade I of the pickled/blast cleaned combination, where lubricant consumption was surprisingly high. This appears to admit of no explanation since die performance on these wires did not differentiate greatly from the remaining results.

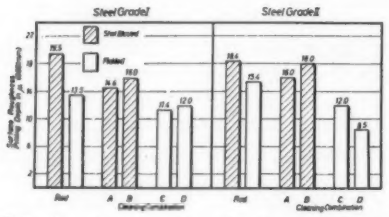

Fig. 19. * * * * * * * * *

In Fig. 19 are shown the absolute depths of surface roughness recorded by means of a Forster Leitz profilometer. It was felt that to show the absolute depths would bring out differences more strikingly than a comparison of the mean roughness values would have done which, generally, were only 30 to 40 pct. of the maximum depths of surface pitting. It will be noticed again that on wires with shot cleaning as ultimate treatment the surface roughness is slightly more pronounced than on the pickled wires (differences up to .005 mm max.).

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The obvious relationship which exists between surface roughness, lubricant consumption and die performance is illustrated in Fig. 20 which summarizes the results shown on Figs. 17, 18, and 19.

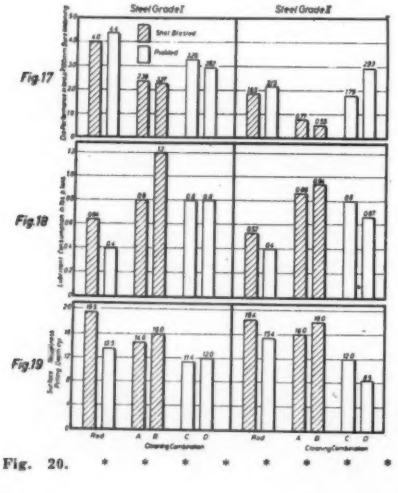

Fig. 20. * * * * * * * * *

Here it is quite apparent that a more pronounced surface roughness is followed by a rise in lubricant consumption and poorer die performance. So it is true to say, as is shown from the composite, that pickled wires, by virtue of the slightly lesser degree of surface roughness, are superior in die performance to high carbon wires cleaned by shot blasting. It would seem, however, that the resulting higher cost in processing shot cleaned wires are, on the other hand, more than offset by the metal losses incurred in pickling.

★ ★ ★

Mechanical Properties. Another point to which particular attention was paid was the effect of shot blasting treatment on the ordinary mechanical characteristics of the wires so cleaned, as compared with pickling. For this purpose, samples were taken from all wires in every processing stage: rod, rod cleaned, patented wire, before and after cleaning, and from each draft. The samples were cut from the beginnings and ends of 4 coils, so that actually 8 tests were made in each processing condition. The values obtained from each were then averaged to give the curves shown in the following figures.

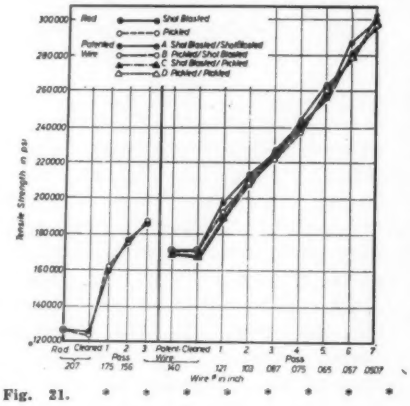

Fig. 21. * * * * * * * * *

Fig. 21 gives the tensile properties developed in wires grade I, as a function of drafting. Over the first breakdown phase from rod to patenting gauge, no difference was observed in the tensile behaviour of pickled and shot blasted carbon wires. After patenting and cleaning by either shot blasting or pickling, and subsequent redrawing to finished size (in 7 holes from .14 to .05 in.) no variations of any significance in tensile have been obtained either between the shot cleaned and pickled lots, the slight divergences recorded on the individual holes lying within normal scatter limits. The results indicate, therefore, that in regard to tensile behaviour shot blasted and pickled wires within this steel category are practically the same.

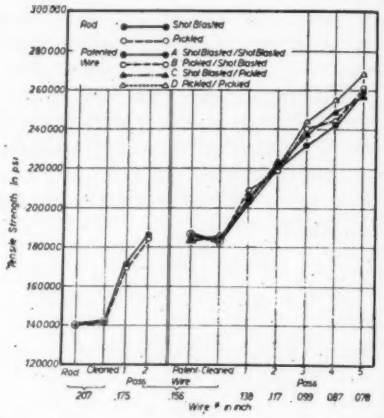

Fig. 22. * * * * * * * * *

The curves in Fig. 22 stand for tensile values developed in wires grade II. Again, in the initial predrawing phase the results are more or less identical. In the second drawing phase as well, variations in the tensile values are of no importance, the difference of plus 7000 p.s.i. measured for the pickled/pickled wire from the third hole onwards being presumably merely incidental. So it can be safely said, in general, that the tensile properties developed in wires drawn from shot cleaned or from the acid cleaned stock are practically the same and that the nature of the cleaning treatment, shot blasting or pickling, has no bearing on these.

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The graph in Fig 23 shows the results of bend and torsion tests obtained on the wires grade I. In general, the characteristics of the curves indicate little difference. Regarding the data obtained on the finished wire (.05 in.) it will be noted that the number of torsions measured on the pickled wire, before failure, was one less than was obtained from the blast cleaned material, whereas in bend characteristics the pickled wires have

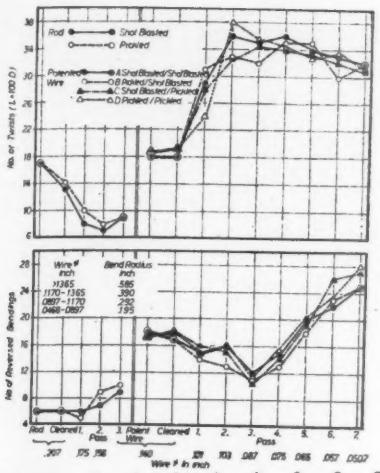

Fig. 23. * * * * * * * * *

produced 2 or 3 more reverse bends over the shot blasted ones.

★ ★ ★

Similar conditions show up for steel grade II, as represented by the curves in Fig. 24, which again follow basically the same line.

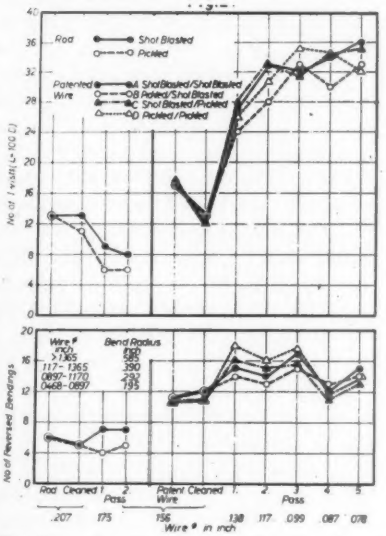

Fig. 24. * * * * * * * * *

Here, both bend and torsion results were found to be slightly higher for blast cleaned wires over the rod breakdown phase. Scattering was slightly more pronounced on the individual drafts, the torsion values obtained on the finished wire diverging for instance by 4 (32 - 36) and the frequency of bends by 2 (13 - 15).

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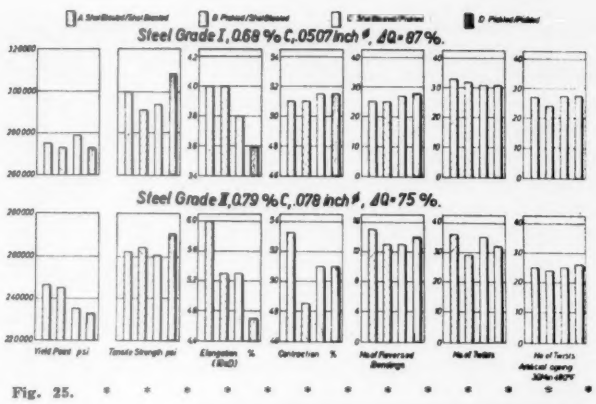
A Shot Blasted/Shot Blasted
B Pickled/Shot Blasted
C Shot Blasted/Pickled
D Pickled/Pickled
Steel Grade I, 0.68 % C, .0507 inch ⌀, 80 - 87 %.
Steel Grade II, 0.79 % C, .078 inch ⌀, 70 - 75 %.
Yield Point psi
Tensile Strength psi
Elongation % (in 2")
Contraction %
No. of Reversed Bendings
No. of Twists
Conical opening

Fig. 25. * * * * * * * * * * * *

The columns in Fig. 25 give a comparison between the respective mechanical properties of the finished wires of both steel grades to which are added the corresponding data for yield point, elongation, contraction and age hardening under conditions established by W. Puengel[3] (1 torsion, 30 minutes heat treatment at about 480°F, then twisting until failure). This table confirms that practically no difference exists in the mechanical properties of wires drawn from shot blasted or from pickled material. The minor variations observed are not significant enough to permit any conclusions on the influence of the different cleaning treatments, and can evidently be ascribed to normal scattering.

Cost Comparison

Finally a word in regard to the cost involved in shot blasting against normal pickling. The picture in Fig. 26 refers to low carbon wires only as they were processed in our works, and the figures shown represent the average costs calculated over a period of one year of shot blasting practice in Hamm, Since the absolute cost for pickling or shot blasting are generally different from mill to mill, only proportional values are given, showing the various items of cost as a percentage of the overall costs.

★ ★ ★

In studying the left hand side of the picture it will be seen that the

3) W. Puengel, in an unpublished article of the Research Dept. of the late Vereinigte Stahlwerke combine.

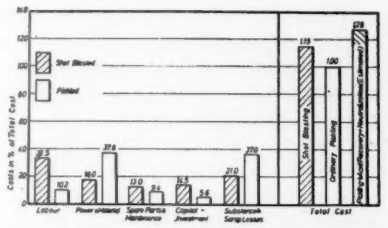

Fig. 26. * * * * * * * * *

labour content of the shot blasting cost is considerably higher than for pickling. Similarly, maintenance and depreciation are more pronounced for shot blasting than in the pickling process. Power and materials, on the other hand, are much higher in the case of pickling which is chiefly due, in the first instance, to steam consumption for heating the pickling tank and, secondly, to the well-known pickling losses in parent metal.

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The picture on the right shows how the overall costs of the two processes compare, where the cost of standard pickling, without regeneration, is used as basis of comparison (factor 1). It shows that the overall cost for shot blasting is 15 pct. higher than that of normal pickling. It should however be taken into account that in our works in Hamm the monthly production in pickled wires is about 6 times as much as the tonnage cleaned in the Wheelabrator plant (10,000 tons against about 1750 tons). It is an old truth that the higher the output the more economical becomes the process, and so it can be assumed that for an

(*Please turn to page* 110)

Continuous Patenting, Cleaning and Coating of Rod

by Raymond F. Warner, Jr.
Manager, Wire Mill
Leschen Wire Rope Division
H. K. Porter Company
St. Louis, Missouri

This paper was presented as a part of the Symposium on Shot Blast Cleaning of Rod at the Annual Convention of The Wire Association in Atlantic City, N. J. on October 14, 1958.

With the steady rise in labor cost, every attempt should be made to modernize equipment and processes to utilize available labor by either speeding up processes or combining as many operations as possible, without effectively increasing the work load for each workman. The high cost of constructing buildings makes us conscious of utilizing and selecting machinery for our operations which requires a minimum of floor space. Smaller inventories can also be maintained by keeping a steady flow of work through continuing operations. These thoughts were foremost in our thinking when H. K. Porter recently installed a wire mill at the Leschen Wire Rope Division.

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The use of a combination of operations seems to be for many reasons the ultimate in efficient and economical production. For many years machinery has been developed for the wire industry combining several reductions in one wire drawing machine. This same thinking has been carried over in the heat treating, cleaning and coating of wire and several wire lines of this type have been developed. But these attempts have been mainly performed on wire and not on rod. The combination of operations on a rod heat treating line to perform subsequent cleaning and coating has always been confronted, in the past, with the almost insurmountable problem of a satisfactory and consistent scale removal. The scale on a rod coming from a hot rolling operation represents from .6% to 1.25% of the weight of a high carbon rod. It is usually of such a thickness that a large part of it can be removed by mechanically bending on a scale breaker of rather simple design, but for most wire drawing applications where high speeds are expected the small particles that remain definitely have an erosion effect to the dies. If a heat treating operation has been performed on the rod, the scale formed during heating is of such a nature that it cannot be effectively removed by bending.

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When H. K. Porter recently decided to build a wire mill for drawing high carbon rope wire, the problem of equipment layout was to incorporate into the design a combination of operations to minimize material handling, thus resulting in an economy of operations with a consistency of quality. It is not the intent of this paper to explain the economy of a single line operation combining a number of processes. Such intangibles as savings in transportation, labor, and reduction of "In process inventories" are self evident. The main purpose of this paper is to present a successful combination of many different processes in a rod patenting line whereby hot rolled rod is started in at one end and is delivered at the exit as a semi-finished product ready for wire drawing. The main reason that these operations can be combined has been the recent design of a mechanical abrasive cleaning machine by Wheelabrator Corporation which permits a consistent high quality cleaning operation with a resultant matte finish suitable for coating, and this machine capable of being installed in a relatively small space.

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The use of a continuous heat treating, cleaning and coating line on wire had been accomplished some time previously and had been used quite successfully due to the nature of the scale formed and the ease at which it could be removed by acid. For this reason it was decided to install continuous heat treating, cleaning and coating line for both rod and wire. To our knowledge there had been no successful attempts to patent, clean and coat hot rolled rod continuously, the limiting operation had always been the cleaning. With speeds of 30 to 50 feet per minute required for furnace operation the use of acid cleaning to remove a tightly adhering scale formed by hot rolling and patenting appeared to be a difficult problem. It is generally accepted that rods have to be soaked several minutes in acid to remove this type of scale. With the furnace speeds this would mean that the acid tanks would have to be several hundred feet long to perform satisfactory cleaning. Usually with available floor space this reason alone was enough to eliminate the use of acid cleaning on a continuous rod line. The use of a protective atmosphere in a rod furnace would serve little or no function, without elaborate scale breaking and constant tension devices in front of the furnace. These devices would aid in shortening acid tanks, but there is no way of

Fig. 1—Wheelabrator rod descaler.

calculating the effectiveness of such an operation since many small particles would still be adhering to the surface of the rod and in order to remove these particles the bare areas would be attacked by acid resulting in an "over-pickled" condition and about .25% metal loss.

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Acid reacts best with iron at ideal conditions of concentrations, temperatures, and dissolved iron salts. Temperature can be controlled and varied as concentrations and iron salts change. It is also possible to control acid concentrate and make-up, but any batch of acid would have to be dumped when iron salt concentrations build up beyond certain limits, this build up being a function of the amount of material cleaned. On a continuous line operation this maximum iron salt build up must be calculated to determine the size of acid tank needed. Tank size should be large enough so that batches of acid may be dumped during shut down periods and not interrupt the continuous operation of the furnace. In most wire mills this would be a week-end function of dumping and remaking an acid tank. Although the use of acid in a continuous coating and pickling line for rods is within the realm of possibility the many variables that enter into the use of acid virtually prohibit its use on a continuous line where a difficult cleaning job is to be performed.

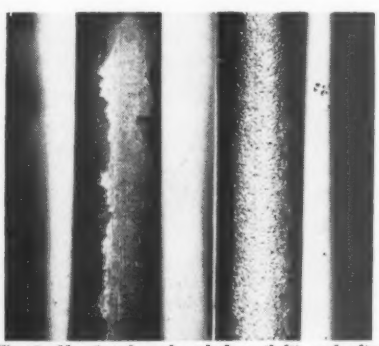

Fig. 2—No. 5 rod surface before (left) and after shot blast treatment. X5.

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For these reasons it was decided to use mechanical cleaning methods which are new to the wire industry but have evidenced some rather consistent cleaning results as previously reported at wire association meetings.

Layout of Equipment

Each piece of equipment in this line had been selected to perform a specific function of operation. Starting with payoff reels in front of furnace which is serviced by overhead cranes large bundles are placed onto double deck floor reels where the ends are tied for continuous operation. The floor reels are adjustable for a variety of coil sizes which may be supplied by various vendors. The furnace is capable of handling 3400 pounds per hour of rod from ½" to .165" in diameter. Sizes under No. 5 rod or .218" are previously drawn on a moto-block either into .187" or .165" size for the patenting operation, then paid off on a standard wire carrier in 1500 pound coils. The furnace is a 40 foot long gas fired unit with two temperature zones whereby the rod is heated by direct convection and it is possible for flame impingement onto the rod. There is no attempt to remove excessive hot roll scale from rod going into the furnace, however, it has been determined that keeping the flame in the furnace just slightly on the reducing side with about 1½% carbon monoxide that the formation of scale in the furnace is kept to a minimum and aids considerably in the prevention of lead drag out in the lead quench.

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It is felt that lead drag out occurs because of a rough surface, uneven oxides permit this lead pick up. Cleaning with a Wheelabrator unit does not remove lead pick up, so unless the problem of lead pick up is solved there will be particles of scale adhering under lead caus-

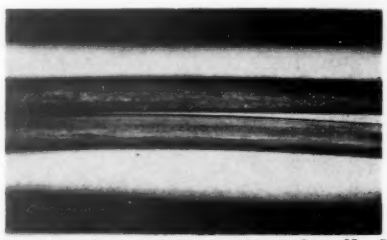

Fig. 3—Surface of .083" wire drawn from No. 5 rod, patented, cleaned by Wheelabrator and borax coated. Note coating on the wire surface. X5.

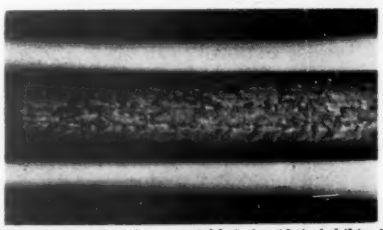

Fig. 4—No. 5 rod over-pickled in 12% inhibited sulfuric acid bath. Surface after pickling. X5.

ing subsequent trouble in wire drawing operations. The lead quench is a standard furnace design for both heating and cooling to maintain a constant temperature for the iso-thermol transformation which occurs in lead patenting. It had been determined that rod leaving a lead quench and entering a cleaning cabinet, especially at the Leschen mill where insufficient space had been allowed for cooling, that a water quench was required after the lead quench and before cleaning cabinet to reduce the amount of heat going into cabinet. The mechanical abrasive cleaning cabinet is next where 2400 pounds of shot is blasted at the rod every minute. This shot is propelled at 1400 feet per minute from four 30 horsepower wheels. The rod emerges from the cabinet with a consistent quality matte finish ready for coating with borax and the final drying. Then the rod continues onto the horizontal take-up frame immediately behind the heavy wire drawing machines. There is a 90 degree turn between the cleaning cabinet and the rod coating tank which serves the dual purpose of permitting us to use available floor space and also in delivering the rod where it is going to be used.

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In the initial start-up of the Leschen Wheelabrator cabinet there was considerable difficulty in preventing fires in the dust collector. Because of this some very valuable information was obtained to minimize the possibility of these fires occurring again. The rod entering directly from the lead quench raised the ambient temperature of the cabinet to 240 degrees F. and we supposed that the ambient temperature of the dust collector was raised beyond the kindling point of the cotton bags. We do know, however, that the addition of the water quench tank although not entirely preventing all fires did lower the ambient temperature to about 140 degrees F. and lowered the temperature of the rod entering the cabinet from 650 degrees F. to 165 degrees F. It is desirable to maintain as high a temperature as possible for successful rod coating operations but common sense limits this temperature of the rod so that wheel bearings and parts will not be expected to operate at temperatures in excess to which they are designed.

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Originally it was thought that the high ambient temperature of the cabinet and dust collector exceeded the kindling point of the cotton dust tubes. Another material of a much higher kindling point, orlon, was used and the ambient temperature was reduced by the water quench tank. However, the fires still continued. It was known that the iron dust was extremely combustible and would burn very readily even in mass if ignited by a match. At this time the atmosphere in the furnace was highly oxidizing and after it was changed to a reducing atmosphere the dust was far less combustible. It was also suspected that spontaneous combustion might have been causing the fires in the dust collecting at the bottom of the hoppers, so the original dribble valves were removed and replaced with motorized rotary valves. After further investigation it was determined that static electricity could start a fire very readily under our operating conditions. An experiment was conducted whereby a jet of air was blown over an old orlon dust tube and a static spark was touched to this bag and a fire immediately started and spread very rapidly. The combination of the air passing through the bags, the iron dust and the bag material seemed to produce an ideal condition for dust fires. At this point it was decided to render the dust and dust tubes as noncombustible as possible. A new set of cotton bags were inserted into the dust collector and lime was metered into the dust chamber to completely coat these bags before any metallic dust was collected. Lime was continued to be metered in for about a month during operation of the line with no subsequent fires. Since this time the cabinet and dust collector have operated for 3000 hours without any indication of fires. Because of initial ambient temperatures all electric conduit was moved back several inches from cabinet to permit air circulation behind it. It was also determined that internal hold downs in the machine were causing snags and breaking of rod —these were removed. The reason for the hold down was to locate the rod in desirable locations in the blast pattern of the wheels.

Operation

The entire furnace line is operated by two men, one man in front of the furnace loading the reels, the other man stripping the horizontal take ups. Such items as shot, furnace supplies and borax are added when needed by these men. Both the cleaning cabinet and coating tank operate with very little attention.

Maintenance

To date this line has run a total of 3,000 hours. Wheel blades have been changed three times. It usually takes 15 minutes to change a set of blades in one wheel. As yet there is slight evidence of wear on some of the liner plates but none have been changed as yet. These plates are cast out of a high strength shock resistant material and resist wear rather evenly. A regular preventive maintenance program had to be instituted to inspect the machine and replace worn parts such as bolts, nuts, washers, etc., which may have eroded away and caused serious damage to the moving wheels. To date the total cost for both labor and replacement parts for maintenance is $.45 per hour. Shot consumption over this period has been 25 pounds per hour. The shot consumption is usually dependent on four factors:

1. **The amount of shot being propelled by each wheel which can be read directly by the amperage load on each wheel.**
2. **The size of the shot being thrown by the wheels. On initial start up a round shot is usually fed into the machine and an angular shot is fed in as your progress. This is done because if an angular shot was initially charged the rod would be excessively roughened but as the shot starts to season itself into fine and large particles an angular shot can be**

(*Please turn to page* 115)

Recent Experience with Shot Blast Cleaning of Rod

by Kenneth J. Sorace
Chief Project Engineer
The Lamson & Sessions Company
Cleveland, Ohio

Last year at this time, I stood before many of you in Chicago and described a Mechanical Descaling Process for making wire out of hot rolled rods.

★ ★ ★

We reported at that time that 250 tons of wire had been processed. Without knowing what it takes to prove a point, let me state that 4 million pounds of wire have now been processed and made into bolts at the **Lamson & Sessions** Plant in Cleveland, Ohio. Perhaps many of you are driving around with these fasteners in your car or are using appliances and equipment at home fastened together with bolts made from mechanically descaled wire.

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This is not intended to be a highly technical report covering micro-structures, fatigue life, surface hardening and the like. These test programs are more properly performed in the laboratory where all the facets of the process can be investigated. I do not feel such a report would be in order at this meeting so we have confined it to the practical aspects of making wire for use on bolt making equipment.

★ ★ ★

At the present level of knowledge, we can say that satisfactory, usable bolt wire of 1016, 1021 and 1038 can be made. We have a group of samples showing the range of extrusions, shoulder upsets and head types made to date. These products meet all the requirements of the industry for their respective configurations and also meet the high quality standards of Lamson & Sessions. All products shown have been run in quantity without any special difficulty.

Kenneth J. Sorace

This paper was presented as a part of the Symposium on Shot Blast Cleaning of Rod at the Annual Convention of The Wire Association in Atlantic City, N. J., on October 14, 1958.

The author graduated from Cornell University in 1940 as an Electrical Engineer. After a brief period as a Laboratory Engineer with the Rochester Gas & Electric Co., he joined the U. S. Army Air Force, where he flew fighter planes in the E.T.O., later spending some time in research and development work at Wright Field.

He joined Lamson & Sessions in 1945 as a Project Engineer and, except for 18 months during 1951 and 1952 on active duty with the Air Research and Development Command in Baltimore, has been with the company ever since.

★ ★ ★

I would like to describe the process for you and delve into our recent experiences and developments.

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A processing line consists of a payoff reel or flipper, a snarl safety switch, a multiroll unit to produce back drag to keep the strand taut and in line through the shot blasting cabinet, a coating bath and a wire drawing block. These can be placed in the form of a straight strand line or placed so as to run the strand in a U-Shape if so desired. The U-Shape configuration allows one man to operate a line since his payoff reel and block are close together at the same end of the line.

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Floor space in the order of 1500 sq. ft. is required for a single line producing drawn wire from rod. Straight line operation would cover about 15′ x 100′ and the U-Shape perhaps 25′ x 60′.

★ ★ ★

As presently built, the blasting cabinets have a pass line about a foot higher than the average draw block pass line. Either a pit for the cabinet or elevation of the draw block is desirable. The logical place for the wire pointer is at the draw block end of the line. In this position, it is necessary only to cut the rod near the die and point it for a size change.

★ ★ ★

The Blast Units in use are 3-wheel devices with the three 19″ x 1⅝″ wheels set 120 degrees apart and powered by 20 HP Motors. The entire cabinet is lined with hard manganese steel plates and each cabinet has its own dust collector.

★ ★ ★

Blasting equipment by its very nature is cannibalistic. Preventative Maintenance is essential to avoid costly repairs and breakdowns. If frequent and proper inspections are made, signs of wear can be spotted early and repairs and replacements scheduled for speedy execution. Other than the above mentioned maintenance, the only operational duties required are starting the various motors that power the unit and routine

Figs. 1-6—These show the range of products produced from shot blast cleaned, bonderized and drawn wire.

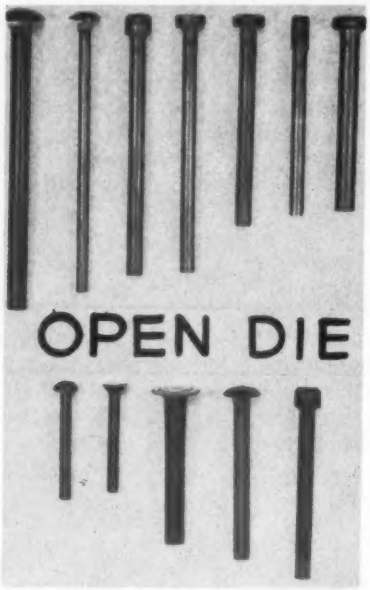

Fig. 1

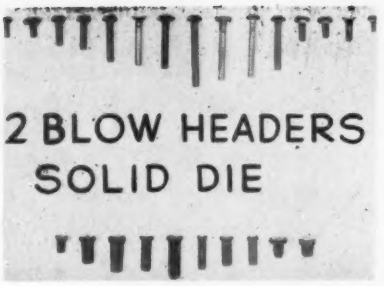

Fig. 3

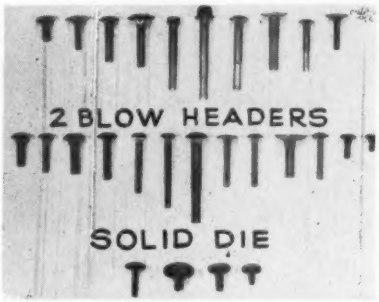

Fig. 4

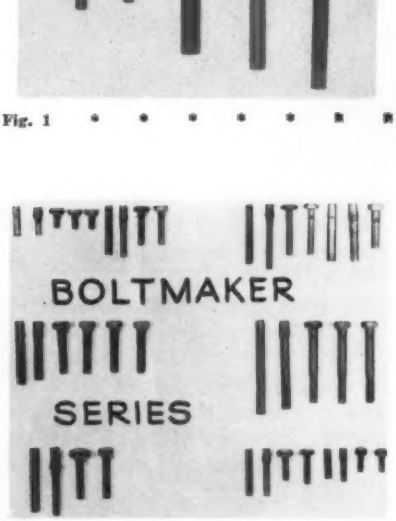

Fig. 2

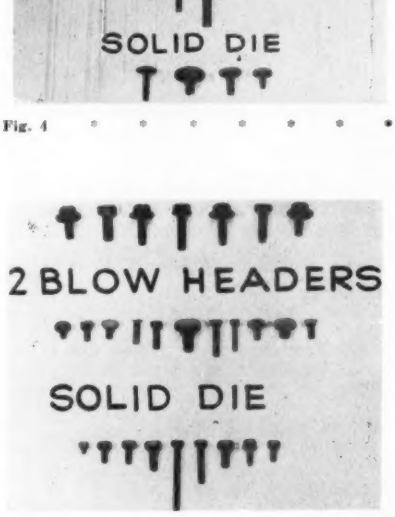

Fig. 5

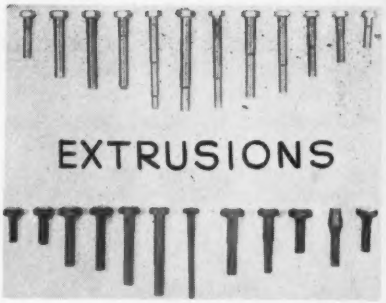

Fig. 6

additions of steel shot. The abrasive flow to the wheels is normally controlled from the draw block. Presently being used is a S-110 Grade with a pellet size of approximately .010 of an inch. It is a heat treated grade of approximately 45 RC Hardness. Shot consumption may vary with units and air separator settings, but in round figures, 50 lbs. of shot every four hours of operation will maintain the working level in the abrasive hopper.

★ ★ ★

Single or multipassing of the rod thru the shot blasting cabinet is possible by the use of turn-around sheaves. Cleaning rates per pass will vary somewhat with the scale condition and diameter of the rod but should be in the order of 150 feet/min.

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In the processing of the rod into wire for boltmaking, it is necessary to provide a coating and lubricant for extrusion and to pre-

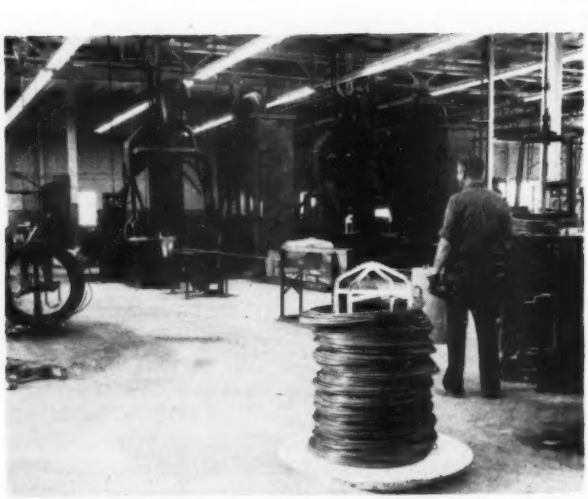

Fig. 7—Original strand line set up for lime coating and drawing after shot blast cleaning.

Fig. 8—View of original lime coating line from opposite end showing drag unit, turn around sheaves and shot blasting cabinet.

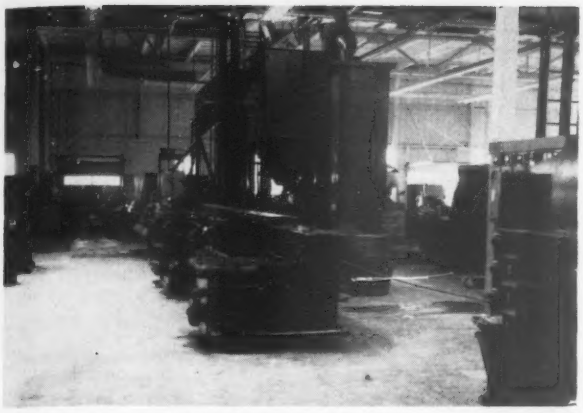

Fig. 9—View of first phosphate coating line taken from the draw block end of the line.

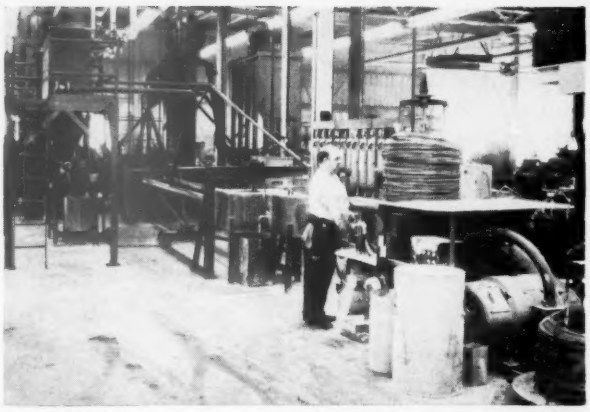

Fig. 10—Most recent development of a bonderite line arranged to multipass rod through the bonderite solution prior to drawing. Balcony contains chemical tanks for feeding the tubes.

vent seizure in solid die heading. The coating requirements vary considerably for different products. In the past year, many base coatings and drawing lubricants were tried in an effort to satisfy these exacting requirements. The products shown were produced from wire that had been bonderized and drawn with either Calcium or Aluminum Stearate. In some cases, wire was sized by double drawing.

★ ★ ★

The development of the coating line has occupied most of our time in recent months. The first line, as shown, a year ago, was for lime coating. The second line was a single pass phosphate coating unit.

★ ★ ★

The most recent development of the phosphate coating line is to multipass the strand line through the bonderite.

★ ★ ★

After setting up multipass sheaves for both the blast cleaner and coating line, a suitable speed of drawing could be obtained. It is necessary in the strand process to run a continuous coil so welding is a must in the operation. With care in welding, different diameters and analysis can be joined satisfactorily. Welds may be cut out if desired but sound welds can be run thru the drawing operation without difficulty.

★ ★ ★

Production of wire over the entire period of operation has averaged 2500 lbs. per blasting hour. Sizes of rod processed have been primarily 13/32 of an inch and under during this time. It is expected that higher tonnages can be obtained with larger rod.

★ ★ ★

Shot Blasted rod may be drawn directly from the unit with suitable draw-box lubricants. However, if lubricant coatings for extrusion are desired, the use of bonderite and stearate base drawing compounds gives a uniform glossy coating. Control and operation of these bonderite baths is not complicated. It is necessary, however, to maintain them at relatively high temperature to produce coating weights over 500 milligrams per square foot of surface. Here also, individual requirements will determine the practice to be followed.

★ ★ ★

The question of heat treatment and plating results may be raised. The only comment I will make on that score is that both have been accomplished without any change in procedures and with no adverse results evident.

★ ★ ★

Gentlemen, I really have nothing more to add. We have lived with our mechanical descaling for several years and through it have been supplying 10 to 20% of our wire requirements. This then, is our recent experience with Shot Blast Cleaning of Rods.

MEMBERSHIP IN THE WIRE ASSOCIATION HAS MANY ADVANTAGES

These are described in a booklet: "The Wire Association — What It Is and How It Functions." It will be mailed to you on request.

All wire men concerned with production or processing problems are eligible to become members. Send for the booklet.

THE WIRE ASSOCIATION

Richard E. Brown, *Executive Secretary*

453 MAIN STREET ● STAMFORD, CONN.

Continuous Patenting, Cleaning and Coating Of Steel Rods

by Donald K. White
Foreman, Annealing
John A. Roebling's Sons Corporation
Trenton, New Jersey

For more than a decade now, the wire industry has been confronted with a strong buyer's market and intense competition from both domestic and foreign sources. Also, the American Mills have been plagued with an annual series of wage increases. To stay in business the mills have engaged in a vigorous modernization program to improve their efficiency. True, price increases have been granted to help offset the increased costs, but where would we be today if we were following the same practices, using the same machines we were in 1946? Chances are, many of us wouldn't be here.

★ ★ ★

Gentlemen, it was just four years ago that I stood before this same group. I came to you to explain about one of the many new installations made in the wire mills at the **John A. Roebling's Sons Corporation** of Trenton, New Jersey, namely, the continuous patenting, cleaning, and coating line used in the processing of steel wire. In that brief space of time, Roebling, like many others, has continued to improve its techniques and equipment—continued along the road of automation. Call it what you will, it still adds up to the same thing: More tons—with less men—for fewer dollars.

★ ★ ★

Today I will illustrate another application of the same principle, only this time, using steel rods. Converting to this system was bound to come; it had to come. In our mills, we were patenting and cleaning rods in two separate operations. Now we have coupled them together — patenting and cleaning of rods in a single continuous line using just the original furnace crew.

DONALD K. WHITE

The author graduated from Worcester Polytechnic Institute in 1951 with a degree of B.S. in Mechanical Engineering.

He joined the John A. Roebling's Sons Corporation as a Foreman in the Steel Wire Mills Division in July, 1951. He has been in several departments throughout the Division and is currently in charge of the Annealing Department.

This paper was presented as a part of the Symposium on Shot Blast Cleaning of Rod at the Annual Convention of The Wire Association at Atlantic City, N. J., on October 14, 1958.

★ ★ ★

Another thing, this installation has, perhaps, an even more far-reaching effect in that we have gone into mechanical descaling. This in itself is not new. It has been used on the continent for years mainly because acid was not plentiful especially during the war years. In this country the problem is somewhat reversed. There hasn't been any real shortage, but how do you dispose of the waste acid? Some people do have a usable system, and still more haven't. If you were told today that you had to dispose of the waste acid within the metes and bounds of your property line, what would **you** do? What would you do? Communities are no longer accepting the old philosophy as expressed by Ken Lewis in his book "Steel Wire in America," wherein he was visiting a plant in New York City. After being there awhile, he conjured up enough courage to ask his host the delicate question, "What do you do with your waste acid?" and received the answer, "We put it in a hole in the floor." Obviously, he inquired about its route and was told "we don't know and the man who used to know is dead."

★ ★ ★

Gentlemen, those days are gone —oh yes, I know, that there are some who still have the hole in the floor; but believe me, the days are numbered. It is only a matter of time until someone will make the grand discovery. You had better give this some serious thought now while there is still time.

★ ★ ★

I don't want you to think for one moment that I am here today to offer a panacea for the problem. Frankly, I don't have the answer, but I do think I can offer a partial solution. Large complex problems resulting from practices followed for years generally aren't solved with one sweeping solution like a magician waving his wand. Instead they are worked out step by step in a slow methodical manner until the goal is achieved. This system, I believe, is a step in the right direction.

★ ★ ★

At our plant, with the patenting

performed in a single operation, a swift tender prepares a coil of rods for patenting by freeing the ends and bending a loop with a long tail on the front end and on the other end a short loop which is held together by a tapered sleeve to form an eyelet. With the aid of an overhead hoist (see figure 1), the coil is placed on the top portion of a double deck swift. The front end of the coil is looped through the eyelet on rear end of the lower coil and wrapped back on itself. When the lower coil has paid off, the upper deck is tripped so the coil will fall into the position of the previous coil, and the upper deck is again refilled.

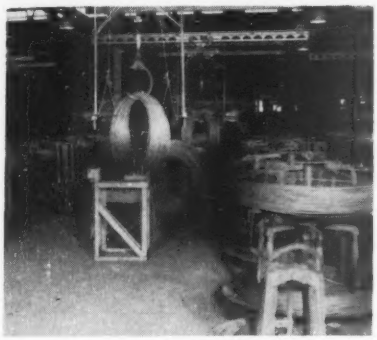

Fig. 1—Pay-Off Swifts— Patenting Furnace.

One swift tender services all twenty-eight swifts of the patenting furnace. Rods are brought to him as required from the storage area by a ram tractor.

★ ★ ★

The furnace tender operates the furnace and lead pan and generally oversees the whole operation. Periodically he assists the swift tender by splicing broken ends. He is required to make tensile tests of the material being processed and to make any necessary adjustments to the lead pan.

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From the swifts the rods pass through the furnace, through the lead quenching bath, and are taken up on the blocks of the take-up frame (see figure 2). Two block tenders strip off the blocks as the rounds come through and move the finished material into a storage area for cleaning.

★ ★ ★

Altogether four men operate the

Fig. 2—Take Up Blocks—Patenting Furnace.

twenty-eight block patenting rig. Normally the production rate will be 1,000 to 1,500 pounds per man hour. Since the speed is varied according to the size, the output will remain about constant.

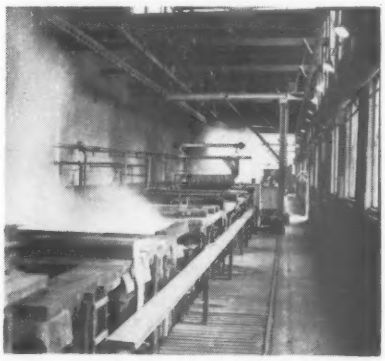


Fig. 3—Straight Line Cleaning Department.

The rods are cleaned in the straight line cleaning department (see figure 3). Ram tractors bring the material in from the patenting shop. Gantry cranes process the material through the line and deliver it to the finish rack. The rods are then taken into the wire mill and placed behind the proper machines. Normally production will be about 6,000 pounds per man hour.

★ ★ ★

The new eighteen strand Continuous Rod Patenting, Cleaning, and Coating Line is laid out in a "U" shape with the pay off swifts and the take-up frame beside each other (see figure 4).

★ ★ ★

The components of the line include the furnace, lead quenching bath, turn around, Wheelabrator machine, borax and lime baths, drying oven, and the take-up frame. Actually the Wheelabrator unit is a centrifugal shot blasting machine which employs hardened steel shot or grit to remove the scale from the surface of the rod. The entire line is contained in an area two hundred fifty feet long and thirty feet wide.

★ ★ ★

The entire eighteen strand continuous rod line is manned by two operators, and it is their direct responsibility to see that all the components of the unit are functioning properly. The "U" arrangement confines eighty to eighty-five percent of the work to a relatively small area. The furnace and lead bath are automatically controlled

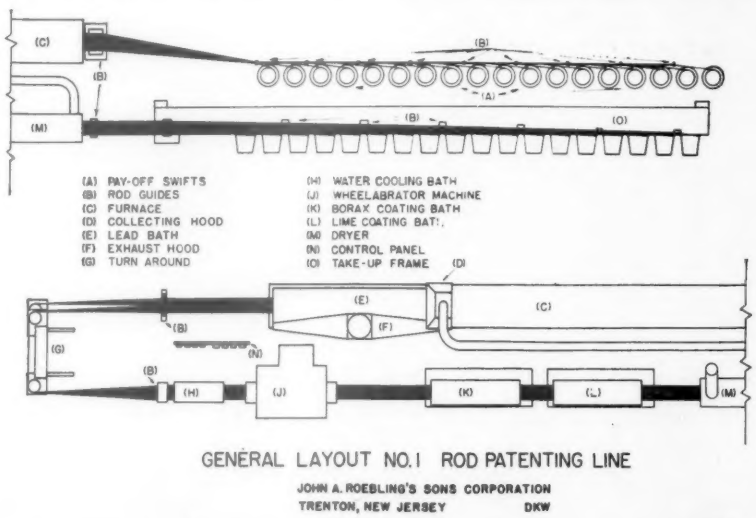
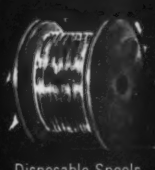


Fig. 4—General Layout—Continuous Rod Patenting & Cleaning Line.

CF&I WIRE...

PACKAGED for YOUR PRODUCTIO

Reels
(500-800 lbs. capacity)



Disposable Spools
(5-70 lbs. capacity)

Fibre Drums
(200-600 lbs. capacity)

Standard Coils, paper-wrapped,
steel-strapped or wire-tied

Steel-st
Wooden

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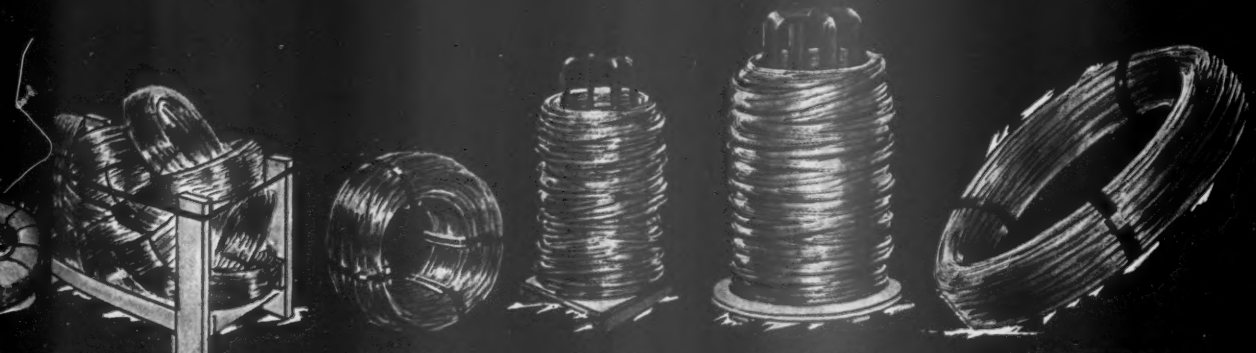

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Steel-strapped Coils (200-2000 lbs. capacity)

so no furnace tender is required, and the Foreman is held responsible for making the necessary temperature adjustments.

★ ★ ★

Six hundred pound coils are delivered to the pay off swifts (see figure 5) by ram tractor once a

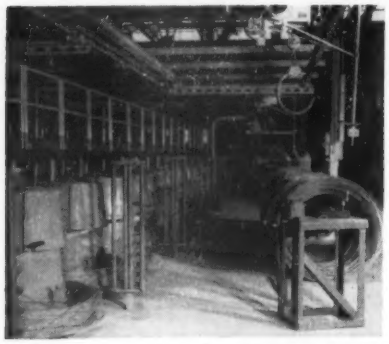

Fig. 5—Pay-Off Swifts—Continuous Rod Patenting & Cleaning Line.

shift. With the aid of an overhead crane the coils are loaded onto the double deck swifts. The coils are freed on the front and back ends, and then the ends are bent into a loop as described in the other system. The tapered sleeves, commonly referred to as "bullets", hold the bent-back end of the coil together to help ease the splice through the line. As the bottom coil pays off, the top one is dropped into its place and another coil will be loaded onto the upper deck.

★ ★ ★

From the pay-off swifts a series of rod stands guide the material into the furnace. The strands are heated in the oil-fired furnace and are quenched in the lead quenching bath. The lead is wiped from the rods as they emerge from the lead bath in a header of mill scale.From here the rods pass over a set of guide sheaves and around the turnaround which reverses the direction of the wire one hundred eighty degrees. The rods then pass through a water quenching tub which, if necessary, will reduce the temperature of the rods before entering the Wheelabrator.

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As the material passes through the Wheelabrator, the rods are blasted by shot to remove the scale. The operation of Wheelabrator will be discussed subsequently in this paper. The wire emerges from cleaning unit to pass into either a borax or lime coating bath, depending upon the manufacturing practice for the product in process. It then passes through a hot air dryer and onto the blocks of the take up frame.

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With the aid of an overhead hoist the six hundred pound coils are stripped from the blocks and placed in the storage area to be transported into the wire mill by a ram tractor.

★ ★ ★

The production rate of the line is six thousand pounds per hour. The speed of the rod varies with the sizes, for example, the 0.218 inch diameter rod runs at forty-four feet per minute and the 0.250 inch diameter rod runs at thirty-four feet per minute.

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The oil-fired furnace, designed by the Roebling Engineering Department (see figure 6), incorporates the best features of the other rod patenting furnaces. It is an air

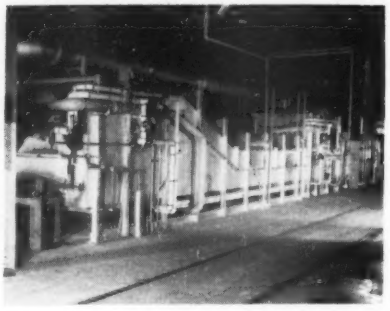

Fig. 6—Furnace—Continuous Rod Patenting & Cleaning Line.

injected, steam-atomized, oil-fired furnace. The furnace is divided into two zones with one burner at the front of each zone projecting the direct flame toward the exit end of the furnace. Each zone is automatically controlled by a Leeds & Northrup Series 60 Control Unit. The temperature is recorded by a chromel-alumel thermocouple. The Leeds and Northrup unit will in turn cause the motorized North American Three Way Adjustable Port Valve to operate and change the temperature of the zone. The burners are ignited by a gas pilot at the bottom of each burner.

★ ★ ★

The oil, steam, and air are supplied in separate lines to the burner. The motorized control valves are hooked together in parallel so all will respond to a change simultaneously thereby maintaining a constant air-fuel ratio. The oil is atomized by the steam just inside the Bloom V.E.T. Emulsion Burner and then is mixed with the air. A seven and one-half horsepower blower beside the furnace supplies the air for the furnace. The oil is heated automatically in a Bell and Gossett heat exchange prior to its entry to the control valve.

★ ★ ★

Normally the furnace will operate between eighteen to nineteen hundred degrees Fahrenheit. The hot gases are drawn from the end of the furnace into a hood which is connected to the dryer at the end of the coating baths. Although the products of combustion will form a quasi atmosphere, no attempt has been made to introduce a formal generated gas atmosphere.

★ ★ ★

A silicon carbide shoe is placed at the front and exit end of the furnace for the rods to bear against as they enter and leave the furnace.

Fig. 7—Lead Bath—Continuous Rod Patenting & Cleaning Line.

The lead quenching bath (see figure 7) is a gas fired, immersion tube heated bath and is located immediately next to and in line with the furnace. The bath is constructed from steel plate and is thirty-one feet long, five feet wide, and sixteen inches deep, and is well insulated on all four sides. It is fired by ten immersion-type, hairpin-shaped burner tubes which ex-

tend down one side and across the bottom of the bath. The mixed fuel is fed into one end and is ignited by a pilot in the open end.

★ ★ ★

The bath is divided into three zones, each of which is controlled by a thermocouple connected to a Leeds & Northrup Series 60 Control Unit. The control valve (see figure 8) is arranged to permit the heating or cooling of each zone.

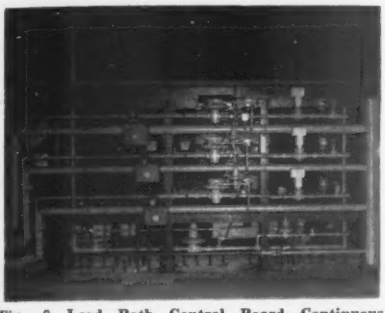

Fig. 8—Lead Bath Control Board—Continuous Rod Patenting & Cleaning Line.

The fumes from the bath are collected in a hood (see figure 9) located along one edge and are exhausted by a large fan to the out-of-doors.

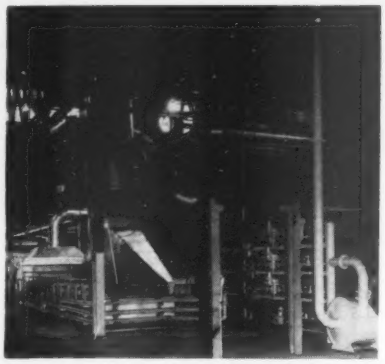

Fig. 9—Lead Bath—Continuous Rod Patenting & Cleaning Line.

The turn-around (see figure 10) is the device which reverses the course of the wire and heads it toward the take-up frame. There are two solid pulleys on each side so arranged that nine strands go into one section and nine into the other. The individual grooves are stationary with respect to each other, but the entire unit does rotate with the strands. This practice should eliminate bearing problems which were encountered in the continuous wire lines.

Fig. 10—Turn-Around—Continuous Rod Patenting & Cleaning Line

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A water bath (see figure 11) is located in front of the Wheelabrator to reduce the temperature of the rods if it is needed. If larger rods are run on this line, there will be more residual heat in the material by the time it reaches this point and forced cooling will be imperative. The material shouldn't enter the Wheelabrator much above two hundred fifty degrees Fahrenheit.

Fig. 11—Water Bath & Wheelabrator—Continuous Rod Patenting & Cleaning Line.

A wire guide is located immediately in front of the water bath to guide the material through it. To insure a long life the guide is made from a Ni-Hard Steel casting.

★ ★ ★

The Wheelabrator and its components including the shot was manufactured by the Wheelabrator Corporation of Mishawaka, Indiana. The primary function of the unit is to blast small pellets at a high rate of speed towards the rods which are passing through the blasting unit in a horizontal plane. Two sets of guide sheaves, one outside and one inside on each end of the unit guide the strands through the machine and keep them spaced equidistant from each other on one and one-half inch centers. Just inside both ends of the unit is a pneumatically operated pressure bar that swings down to introduce tension into the rods as they pass through the cleaning zone. This prevents the rods from rotating as it passes between the wheels. In some instances the guides are not necessary to obtain the proper cleaning.

★ ★ ★

A set of pneumatically controlled guide sheaves are located just outside the unit on each end to guide the rods externally. The outside sheave guide will drop down, and the inside bar will rise to release the rod tension and facilitate the stringing of the strands through the line.

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Four thirty-horsepower motor driven wheels (see figure 12) propel the shot toward the rods and are located with two above and two below the rod path and set at ninety degree to the line of travel.

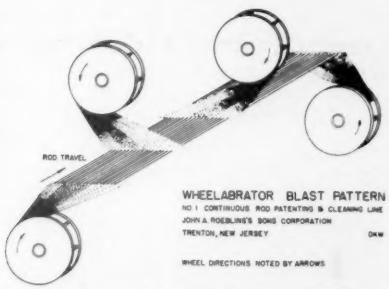

Fig. 12—Shot Pattern—Wheelabrator—Continuous Rod Patenting & Cleaning Line.

The two lower wheels are located near the outside wall of the chamber with one wheel on each side. The wheels rotate opposite each other and project the shot in a triangular pattern up and toward the opposite wall. The two upper wheels are located just off the center of the chamber and cast the pellets in a similar triangular pattern down at the material. These wheels rotate opposite each other, and the pattern of one wheel is the reverse of the other. The four patterns are so arranged that each wheel cleans about one quarter of the rod surface. The blasting wheels are spaced along the length of machine taken with respect to the rod path through the machine. The blasting zone is about six feet long, and it is, therefore, most important that the rods do not rotate

while in the area; since, if such did happen, one quadrant would be cleaned twice while one would be omitted altogether.

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Each wheel is nineteen and one-half inches in diameter and two and one-half inches wide and rotates at 2250 R.P.M. The wheel has eight radial blades spaced equally around the circumference, and these blades project the shot from the wheel. Each wheel will project about 700 pounds per minute, and the entire shot charge of four tons will recirculate through the machine in two to three minutes.

★ ★ ★

The "hot spot" of each wheel, that is the area which receives the most intense blasting, is carefully aligned so the entire shot pattern will cover only the space occupied by the rods. The blasting pattern is regulated by rotating the control cage near the center of each wheel. The control cage is a slotted cylindrical sleeve hooked to the feed spout and governs the point on the wheel where the shot is introduced. This is usually one hundred eighty degrees from the discharge point on the wheel.

Fig. 13—Wheelabrator Upper Wheels—Continuous Rod Patenting & Cleaning Line.

The cleaning media is fed by gravity from an elevated hopper (see figure 13) through tubes to the feed funnel of each wheel. From the feed spout the shot feeds into the center of the wheel onto the series of eight radial blades which cast the material by centrifugal force in a manner similar to fluid in a centrifugal pump. The shot will either hit a strand of rod or strike against the "long life" plates which shroud the blast pattern periphery of each wheel inside the machine. These are one inch thick plates which are made from a special cast alloy steel and are mandatory for preserving the life of the machine cabinet. After striking a surface, the material will fall into a hopper located beneath the lower set of wheels.

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A swinging gate valve outside the feed funnel controls the amount of shot admitted to each wheel. The amount is constant, and once the adjustment is made it doesn't have to be changed. The primary purpose of the valves is to close off the flow of shot to the wheels. An ammeter is hooked in with the motor power line of each wheel to measure the current it is drawing and thereby determine the load on each wheel.

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The shot drops into a hopper (see figure 14) and is guided to the rear of the machine where an endless bucket elevator returns the contaminated abrasive to the separator and storage hopper. The elevator is an endless rubber belt onto which is fastened a series of buckets. The elevator control motor is electrically tied in series with the solenoids which operate the swinging gate valves at the feed funnel. Unless the elevator motor is operating, the valves can't open. This prevents the shot from accumulating in the bottom hopper and risking the overloading of the elevator which may stretch the elevator belt.

Fig. 14—Wheelabrator Return Hopper—Continuous Rod Patenting & Cleaning Line

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The buckets pour the shot onto a feed screw (see figure 15) that transfers the material to the separator. A coarse wire screen prevents large material, i.e. wire, paper, etc., from falling into the separator. This material moves all the way across the screen and is dumped into the refuse pipe. The balance of the material falls through a screen and piles up against a hinged baffle. This baffle is adjusted so the abrasive will spread across the shelf beneath the baffle and flow out in a thin stream over the permanent baffle.

Fig. 15—Wheelabrator—Continuous Rod Patenting & Cleaning Line.

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It is at this point the contaminated material is cleaned so that only good shot will be returned to the storage bin (see figure 16). This is accomplished by passing the material through an air wash. All the material will fall vertically over the baffle, and a stream of air is drawn through it. The scale and broken shot are drawn by the air towards the dust collector. A blast gate in the duct line connecting the separator with the dust collector is regulated so that no good material is drawn into the dust collector. The good material drops back into the storage bin.

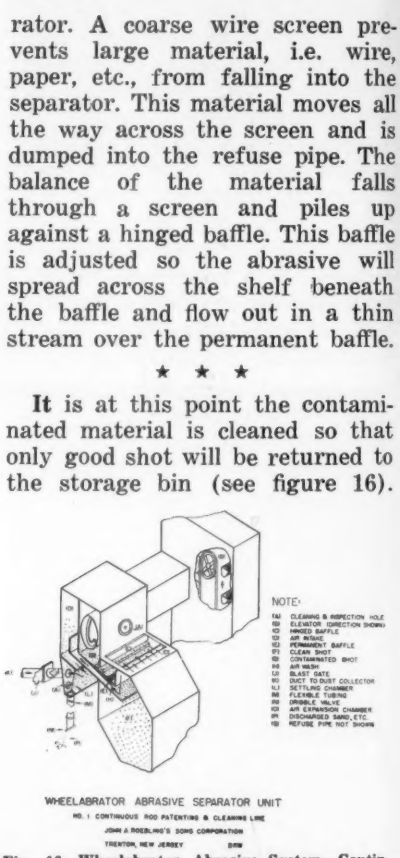
NOTE:
WHEELABRATOR ABRASIVE SEPARATOR UNIT
NO. 1 CONTINUOUS ROD PATENTING & CLEANING LINE
JOHN A. ROEBLING'S SONS CORPORATION
TRENTON, NEW JERSEY

Fig. 16—Wheelabrator Abrasive System—Continuous Rod Patenting & Cleaning Line.

The material which is too heavy to be drawn to the dust collector will drop into the settling chamber and flow down the flexible tube and out a dribble valve.

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A duct is also connected into the collecting hopper beneath the lower blasting wheels. The blast gate is regulated on this line to maintain a negative pressure inside the Wheelabrator and also to pick up the very fine material dropping into the hopper.

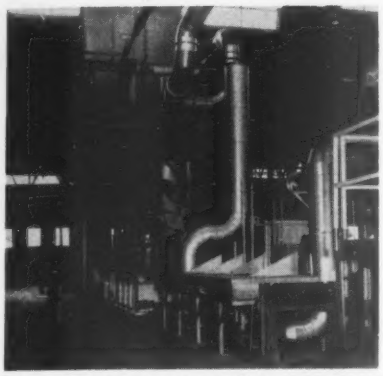

Fig. 17—Wheelabrator Dust Collector—Continuous Rod Patenting & Cleaning Line.

The dust collector (see figure 17) is divided into two halves by a verticle baffle. Inside a series of long thin canvas dust collecting bags are mounted vertically with the closed upper end hooked to a rocker arm. The lower end is open and is mounted on a fixed plate. A ten horsepower motor-driven blower is mounted outside the unit to draw the dust into the bottom of the bags from the Wheelabrator. The dust is collected in the bags and the air passes through them and is exhausted from the blower.

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The dust collector is operated on a regular twenty minute cycle. A timing device operates a damper in the exhaust duct line causing the dust to be drawn first into one side and then into the other. The inoperative side will start the cycle with the shaker mechanism shaking the bags for three minutes to loosen the collected dust inside. During the balance of the cycle the bags drain and the dirt falls into the hopper below. A rotary valve opens and allows the material to pass through into a storage drum or container. The material is periodically moved outside the building by one of the operators.

★ ★ ★

An analysis of the dust will reveal a high percentage of finely divided iron. It is entirely possible that a fire can start in the hoppers of the dust catcher. Experience from other installations indicates that an electrostatic charge will build up on the cloth bags. A quantity of lime is introduced into exhaust dust line at the Wheelabrator to coat the bags and reduce this possibility. The dust must not be allowed to accumulate in the hoppers below the dust catcher as a fire may start there by spontaneous combustion.

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From the separator, the good shot will drop through the air wash and fall into the storage bin. The bin must be at least three quarters full to provide the necessary pressure on the shot for the unit to function properly. A "Bindicator" is located at the critical level and is a pressure device that will sound an alarm if the level gets too low. It is also electrically connected to the supply hopper which will open to admit a fresh supply of shot. It is the responsibility of the operators to keep this bin full so it will admit the make-up shot at the proper time.

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The shot is available in several sizes from the Wheelabrator Corporation. The shot is round steel shot heat treated to a hardness of forty-two to fifty Rockwell "C". This unit is using S-110 shot which is approximately 0.011 inch in diameter. The shot has to be replaced at the rate of approximately twenty-two pounds per hour.

★ ★ ★

Two coating options are available in this line, borax or lime. Both tanks (see figure 18) are similar in basic design and differ only in the heating system. The tanks are built along the lines of a double tub with the upper tub filling with solution and flowing out the ends through weirs into the lower tub. The weirs are protected from wear by silicon carbide blocks at the ends of each tub. The solution

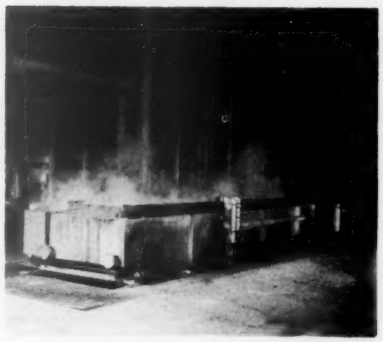

Fig. 18—Coating Baths—Continuous Rod Patenting & Cleaning Line.

drains from the lower tub back to the fifteen horsepower pump to be recirculated again to the upper tub at the maximum rate of about five hundred gallons per minute. The rods pass through the weirs and are coated in the upper tub. A wipe at the exit end will drain off the excess solution. The borax tub is heated by steam coils in the upper tub while the lime is heated by live steam injection. The borax solution is maintained at fifteen ounces of borax per gallon and is heated to two hundred degrees Fahrenheit. The lime bath is maintained at approximately eight per cent and is heated to one hundred eighty degrees Fahrenheit.

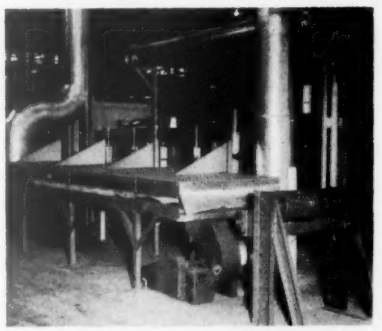

Fig. 19—Dryer—Continuous Rod Patenting & Cleaning Line.

The dryer (see figure 19) is a long rectangular enclosure using the hot exhaust gases from the furnace to dry the coating on the wire. The gases are pumped from the exit end of the furnace through the dryer and then are exhausted.

★ ★ ★

The take-up frame (see figure 20) consists of eighteen forty-two inch diameter blocks. The unit is made up from a series of eighteen Cleveland Worm Gear Reduction

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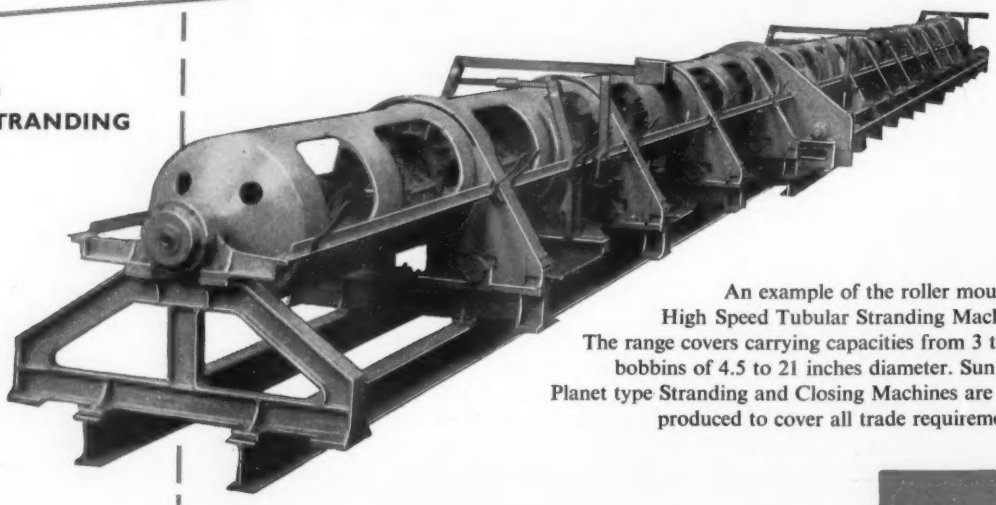

An example of the roller mounted High Speed Tubular Stranding Machine. The range covers carrying capacities from 3 to 45 bobbins of 4.5 to 21 inches diameter. Sun and Planet type Stranding and Closing Machines are also produced to cover all trade requirements.

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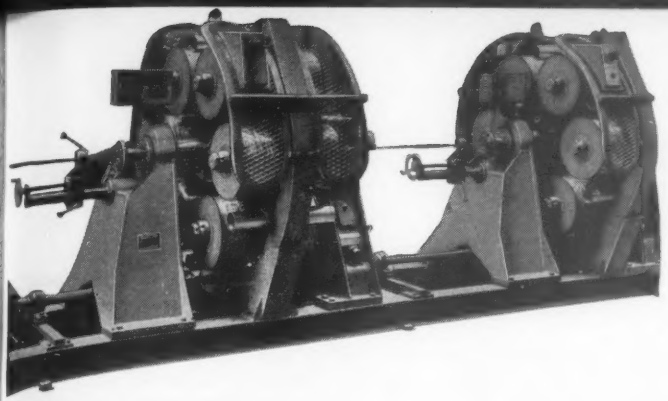

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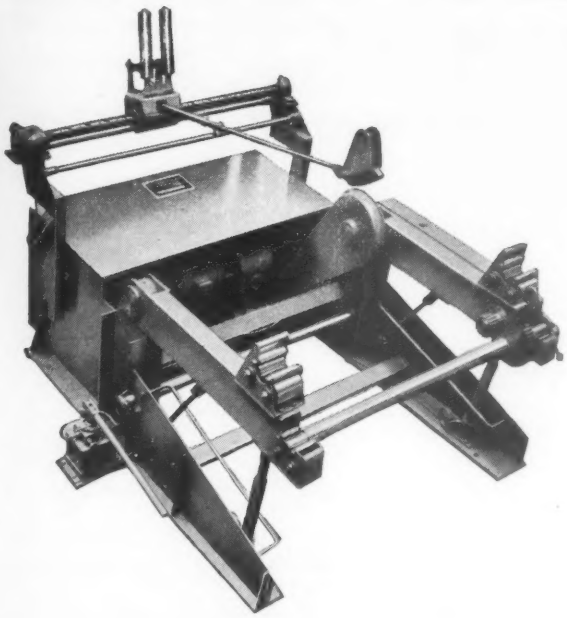
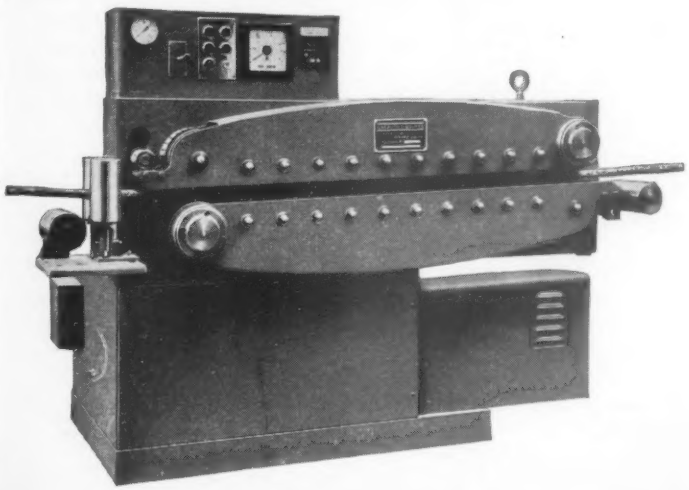
The Larmuth & Bulmer Fixed Bobbin Stranding Machine produces high quality stranding at 50% higher speeds than the Sun and Planet method. Initial costs are low. Floor space is saved. Maintenance is reduced. Many automatic refinements are introduced.



INDEPENDENT TAKE-UP DRUM STAND

This Larmuth & Bulmer independent Take-up Drum Stand can be transported from one machine to another. A new traverse action automatically coils without the aid of the usual standby labour. Cable tension and stop mechanism is electrically controlled to dispense with the friction clutch method. Loading is eased by a hydraulic system.



CATERPILLAR HAUL-OFF

The Caterpillar Haul-Off uses endless belts of rubber shoes which fully protect the cable during haul-off. Grip may be pre-selected and simply controlled. It is positive and constant throughout operation. The unit does not require special foundations or the usual haul-off drum pit. It can be used as a reliable independent measuring device.

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Fig. 20—Take-Up Frame—Continuous Rod Patenting & Cleaning Line.

Units connected together in series and driven centrally from a forty horsepower motor. Each block can be disengaged by a clutch to stop the block. The block speed is varied by controls in the instrument room.

★ ★ ★

There are several control stations located around the rig so the operators can start, stop, or slow down the blocks of take-up while they are stringing a broken rod through the line.

★ ★ ★

When the continuous rod line was first taken under consideration, the question of mechanical versus acid cleaning was thoroughly investigated. One of the most obvious advantages is the complete elimination of an age old problem in the wire industry—the disposing of waste acid.

(*Please turn to page* 95)

FERROUS TECHNICAL SESSION DISCUSSIONS

Tuesday Afternoon, October 14, 1958

SYMPOSIUM ON SHOTBLAST CLEANING OF ROD

MODERATOR

Dr. Walter O. Everling, Dir. of Research
American Steel and Wire Div., United States Steel Corp.,
Cleveland, Ohio

The five papers comprising this Symposium immediately precede these discussions, the principal points on which information was desired being summarized in the following paragraphs.

★ ★ ★

Relative to cold heading wire, Mr. Krautmacher said the only cold heading they did was on nails.

★ ★ ★

Mr. Sorace was asked by the Moderator whether the cleaning and coating work he had described applied only to the simpler cold heading jobs, to which Mr. Sorace referred to his display of samples, saying that some were simple and some were difficult, the results being determined by the proper coating procedure. The size of the cold headed pieces is not limited, except by the equipment available in their shop.

★ ★ ★

Mr. Krautmacher said in response to a question on the use of steel shot, that they had only used cut wire for descaling and had not investigated the shot.

★ ★ ★

Mr. White was asked if they had ever used flippers instead of reels to pay off the rod. He said they hadn't because the double head skids they used enabled them to cut down their man power.

★ ★ ★

A question on the largest diameter wire descaler in a Wheelabrator, brought from Dr. Berge the reply that 6mm (about ¼ inch) was the largest. Mr. Sorace commented that Sheffield Steel was shot blasting .550″ rod (9/16″), but it was run through twice. Another member said rod of ¾″ was being cleaned there also.

★ ★ ★

Regarding the amount of shot per ton, a member said he had gathered the impression that the German descaling process used 2 pounds of shot per ton against our consumption of 12-25 pounds per ton. Dr. Berge said this was correct, but the cut wire was a high tensile one. Mr. White said they used about 25 pounds per 8 hour shift in which they cleaned 6,000 pounds of rod. Mr. Sorace advised that they cleaned 3000 pounds per shift.

★ ★ ★

A member stated that the German machine had 40 strands, whereas they had a maximum of 18 using the same horsepower, and this difference would not be affected by an increase in the number of strands. The abrasive consumption would remain the same for the smaller number of strands. The German cleaning speed was about 45 FPM.

★ ★ ★

As to breaks in the wire, Mr. Krautmacher stated that this seldom occurred, but when it did the machine had to be shut down. Mr. Everling added that breaks could come from poor welds and where the operator did his own butt welding, he soon learned to be careful to avoid poor welds. Mr. Warner said that they did not stop for breaks, but hooked the wire onto another traveling through. The abrasive stopped blowing only when the take-up stopped. Dr. Berge called attention to the fact that patented wire was straight and came through easily, whereas some other types had kinks that could cause trouble.

★ ★ ★

There being no other questions, the meeting was adjourned.

The Annual Convention of The Wire Association

by Edmund D. Sickels, Editor
Wire and Wire Products
Stamford, Connecticut

In 1958 the Annual Convention was held in Atlantic City, N. J. from October 13th through the 16th at Haddon Hall.

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It was a highly gratifying convention in all aspects, and the weather during the week was ideal. Although room reservations for 725 people—60 of them being for ladies—were received in advance of the meeting, only 530 men registered, some 135 persons who had come failing to put in an appearance at the registration desk. These, it is presumed, were largely the representatives of supplier concerns who remained in their rooms for entertainment and talks with mill men. Never before have so large a number failed to record their presence officially.

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The registration desk opened at 9:00 AM and was busy throughout the morning. The only official activity during this period was the regular annual meeting of the Board of Directors.

Meeting of the Board of Directors

President Tom M. Girdler, Jr. called the meeting to order at 10 o'clock, Monday morning, October 13, 1958.

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After the roll call, he asked Secretary-Treasurer Brown to read the minutes of the last meeting and as Treasurer to read the Treasurer's report. Except for a correction to the effect that Mr. Sanderson had reported that enough information had not been secured on resort hotels to make a decision, both the minutes and the Treasurer's report were duly approved.

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Mr. Donnellan read the Teller's report on election of directors in 1958, stating that 742 ballots had been received, and with 705 needed to elect them, the nominees were elected. These were:

Harold W. Adams (3 years)
Director, Elec. Conductor Products
Reynolds Metals Co., Richmond, Va.

Allan B. Dove (3 years)
Product Development Metallurgist
Steel Company of Canada, Ltd.
Hamilton, Ont., Canada

RAYMOND S. WORTH
General Program Chairman

Mr. Worth, a native of Maine, attended college in Worcester, Mass., following which he worked for American Steel & Wire Company and the Wickwire Spencer Steel Company there. In 1939 he went to Baltimore where he joined the staff of Bethlehem Steel Company. In 1944 he became affiliated with John A. Roebling's Sons Corporation, where he now is Manufacturing Manager, Steel Wire Mills Division in Roebling, N. J. He is a member of the Engineers Club of Trenton, the American Society for Metals and The Wire Association.

William L. Dull (3 years)
Superintendent, Wire Mill
Sheffield Div., Armco Steel Corp.
Houston, Tex.

Walter B. McShane (3 years)
Chairman, Wire Committee
American Steel and Wire Div.
United States Steel Corp.
Cleveland, Ohio

Charles H. Williams, Jr. (3 years)
Supt., Wire and Rod Mills
Pittsburgh Steel Co., Monessen, Pa.

Clement C. Lawson (3 years)
Plant Facilities Engineer
Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

John C. Murray, Jr. (3 years)
Vice President
Crescent Insulated Wire and Cable Co.
Trenton, N. J.

H. S. Spaulding (3 years)
Technical Superintendent
Kaiser Aluminum & Chemical Corp.
Newark, Ohio

William Mohr (2 years)
Works Manager
The Colorado Fuel & Iron Corp.
Oakland, Calif.

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Mr. Girdler congratulated them and, by way of introduction, asked each to stand as their names were called.

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Mr. Worth then reported on the program for the Convention in Atlantic City, giving all credit to **Dartrey Lewis** and **Clement C. Lawson,** the Ferrous and Non-Ferrous Program Chairmen, respectively, for the job they had done in assembling the technical papers to be presented. He announced arrangements for the plant tours on Thursday and told of the plans made for a trip to Princeton for the ladies.

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A motion of thanks to Mr. Worth's company was made by

TOM M. GIRDLER, JR.
Retiring President

Mr. Potter, which was duly recorded and passed.

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Mr. Lawson was called upon for a report on the Non-Ferrous program. He told of the papers secured and of their having set up a Papers Review Committee, which functioned on this meeting and will perform similar services for future meetings.

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Mr. Whitney, as Chairman of the Board of Past Presidents, reported that **John Rigby,** Director of **John Rigby and Son, Ltd.,** England, had been selected as the 1959 Mordica Memorial Lecturer. The suggestion was unanimously approved.

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Director Potter, Chairman of the Nominating Committee for Officers, recommended for President, **Allan B. Dove;** for Vice President, Ferrous Division, **Raymond S. Worth;** for Vice President, Non-Ferrous Division, **Clement C. Lawson;** and for Executive Secretary, **Richard E. Brown.** Mr. Crapo moved that the nominations be accepted. It was seconded by Mr. Williams, put to vote, approved, and the nominees were duly elected and seated for the 1958-1959 term.

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Following this, Mr. Corson, Chairman of the Nominating Committee for the Executive Committee, proposed the names of **Allan B. Dove, Clement C. Lawson, A. M. Reeder, Raymond S. Worth, Benoit J. Sirois,** and **Richard E. Brown.** Mr. Potter moved the approval of the nominations, which was seconded by Mr. Brown. The ensuing vote elected these gentlemen for the year of 1958-1959.

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Mr. Potter, asked about plans for the West Coast Regional Meeting next June, suggested **Lloyd W. Albright,** Manager, Wire and Special Products Sales, **The Colorado Fuel and Iron Corp.,** Oakland, Calif., as Program Chairman, the meeting to be held in San Francisco. Mr. Girdler thereupon formally appointed Mr. Albright and recommended that all directors attend the meeting, to which Mr. Potter added a few remarks in support of the idea.

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Mr. Girdler then appointed **David M. Schmid** and his committee to serve for one more year on the Awards Committee.

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The next order of business was the appointment of men to serve on The Electric Wire and Cable Committee, resulting in the re-appointment of the eighteen men who currently comprise its membership under the chairmanship of Mr. Lawson.

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The Membership Committee for 1958-1959 was appointed by Mr. Girdler, the persons named being **Leonard C. Crewe, Jr., James E. Flood,** and **Leslie C. Whitney.**

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Mr. Dull was called upon for a report on the Regional Meeting to be held on May 7 and 8, 1959, in Houston, Texas. He said that their plans would follow the usual Regional Meeting procedure, and would be wound up with a barbecue. He stated that most of the technical papers for it had been arranged for, and that they were fine papers, all on ferrous subjects.

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Mr. Flood moved that The Electric Wire and Cable Section be authorized to hold a meeting in the Spring. The motion was seconded and approved. (Note: At a later meeting of this section's committee, the Statler Hotel, Boston, Mass., April 23 and 24, were selected as the time and place, with **Urbain J. H. Malo,** Technical Director of **The Crescent Company** as Program Chairman.)

ALLAN B. DOVE
The New President

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Under the heading of "New Business", Mr. Brown raised the question of making our Annual Luncheon more entertaining. It was proposed that the Mordica Memorial Lecture be given at the opening session on Monday and a man of outstanding reputation be named for the after-luncheon speaker. After various expressions of opinion, the matter was referred to the Board of Past Presidents to consider the subject and make recommendations to the Board of Directors at its next meeting in the Spring.

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Mr. Sanderson brought up the matter of a Convention in a resort city, reporting such information as he had secured. The question was discussed, and he was directed to secure additional information for recommendations to be made at next Board meeting.

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Mr. Girdler, in closing, remarked that he had enjoyed greatly his two year term of office and had appreciated the fine cooperation he had secured from the staffs of the Association and Wire and Wire Products and from the directors, for all of which he was grateful.

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A motion was made to approve

the actions of the officers for the period covered by the semi-annual report of the Secretary-Treasurer. The motion was duly seconded and approved.

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There being no further business, the meeting was adjourned.

The Directors' Luncheon

Following the conclusion of the Board meeting, the directors adjourned to the West Room, where they entertained the program participants—committee members and speakers — for cocktails and luncheon. After the luncheon, Mr. Girdler welcomed the group to the 28th Annual Convention and expressed his great appreciation of all the fine work that their presence represented.

THE TECHNICAL SESSIONS

Joint Ferrous and Non-Ferrous Meeting

Monday Afternoon, October 13

These sessions opened at 2 o'clock with a Joint Ferrous and Non-Ferrous Symposium on Aluminizing, which was preceded by an address of welcome by President **Tom M. Girdler, Jr.**

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C. C. Tappero, Superintendent of Wire Mills, **Colorado Fuel & Iron Corporation,** Pueblo, Colorado, served as Moderator for the Symposium, which embodied five papers.

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H. J. Godfrey, Assistant Chief Engineer, Research and Development, **John A. Roebling's Sons Corp.,** Trenton, N. J., led off with a paper on "Aluminum Coating of Steel Wire." **Robert F. Joy,** Engineer in the Development Research Department of **Bethlehem Steel Company,** Bethlehem, Pa., gave a paper on "Batch Type Aluminum Coating of Small Steel Parts."

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R. E. Griffiths, Assistant Director of Research, **American Steel and Wire Div., United States Steel Corp.,** Cleveland, Ohio, followed with a paper entitled "Aluminum Coated Steel Wire Products." **Leslie C. Whitney,** Director of Research and Development, Copperweld Steel Co., Glassport, Pa., then delivered a paper on a very new development—"Alumoweld Wire." The final paper, authored jointly by **E. T. Englehart** and **K. J. Brondyke,** Research Engineers at the Alcoa Research Laboratories of the **Aluminum Company of America,** New Kensington, Pa., was concerned with "Resistance to Corrosion of Aluminum Coated Steel Wire."

Ferrous Technical Session

Tuesday Morning, October 14

With Charles H. Williams, Jr., Superintendent of the Rod and Wire Mills of the **Pittsburgh Steel Co.,** Monessen, Pa., acting as Moderator, the session opened at 9:30 A.M.

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Charles A. Kuhl, Metallurgist, **Pittsburgh Steel Co.,** opened the meeting with his paper on "The Manufacture of Welded Wire Mesh and Some of its Uses." **H. F. Sanderson,** Wire Mill Manager for **Frederick A. Power & Sons Ltd.,** Saltley, Birmingham, England, presented an interesting description of "Mechanical Descaling of Wire Rod in England."

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Rudolph H. Hertzog, Metallurgical Engineer in The Steel Wire Mills Division of **John A. Roebling's Sons Corp.** at Roebling, N. J., next presented a paper in "Lead Patenting of High Carbon Steel Rod and Wire," and the session concluded with a paper delivered by **Richard Bliss,** Unit Leader, Furnace & Associated Plant Equipment Sales, Industrial Heating Div., **General Electric Co.,** Shelbyville, Ind., entitled "The New Galvanizing Line at Greenings." The paper had been jointly written by Mr. Bliss and **G. R. Armstrong,** Chief Engineer, and **G. V. Globe,** Wire Mill Superintendent, both of the B. Greening Wire Co., Ltd., Hamilton, Ont., Canada.

Ferrous Technical Session

Tuesday Afternoon, October 14

This session was devoted to a Symposium on Shot Blast Cleaning of Rod, opening at 2:00 P.M. with **Dr. Walter O. Everling,** Director of Research, American Steel & Wire Division, United States Steel Corp., Cleveland, Ohio, in the chair as Moderator.

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He first introduced two gentlemen from Germany, who presented a paper in two parts. Part I—"Introductory Remarks on Mechanical Descaling," was given by **Dr. Heinz Berge,** Technical Director, **Westfalische Union A. G.,** Hamm (Westf.), Germany. Part II—"Recent Experience in Shot Blasting Practice," was presented by **Dr. Hans Krautmacher,** Chief, Experimental Station, of the same company.

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R. F. Warner, Wire Mill Manager, **Leschen Wire Rope Div., H. K. Porter Co.,** St. Louis, Mo., then gave a paper, "Continuous Patenting, Cleaning and Coating of Rod." He was followed by **Kenneth J. Sorace,** Chief Project Engineer, **Lamson and Sessions Co.,** Cleveland, Ohio, whose paper, "Recent Experience with Shot Blast Cleaning of Rod" was a sequel to a paper on the same subject given in 1957, to which he added new data based upon the last year of operation of this system.

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The final paper, by **Donald K. White,** Foreman of No. 2 Mill, John A. Roebling's Sons Corp., Roebling, N. J., was entitled "Continuous Patenting, Cleaning and Coating of Rod."

Ferrous Technical Session

Wednesday Morning, October 15

Stewart S. Gray, Assistant Vice President, **Union Wire Rope Corp.,** Division of **Armco Steel Corp.,** Kansas City, Mo., acted as Moderator for this meeting.

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Papers presented included one by **T. W. Harmon,** Manager of Orders, and **J. C. Farrell,** Assistant Manager of Orders, Union Drawn Steel Div., Republic Steel Corp., Massillon, Ohio, on "A Modern

Order Entry and Invoicing System." The paper was read by **Tom M. Girdler, Jr.,** Division Manager of **Union Drawn Steel,** who prefaced the presentation by calling attention to a panel discussion on the subject several years back. He noted that the system then in use had been abandoned and the new electronic order entry system here described installed, using Bell Telephone teletype equipment.

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Carlton W. Garrett, Product Engineer, Product and Development Div., Jones & Laughlin Steel Corp., Pittsburgh, Pa., showed a film on "Experimental Prestressed Concrete Highway," in introducing which he made a few brief remarks, followed by further comments at its conclusion.

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Raymond D. Hallberg, General Superintendent, and **Fred A. Locke,** Chief Process Engineer, **Wilbur B. Driver Co.,** Newark, N. J., were responsible for the third paper on the subject of "Spooling of Fine Wire," and **Arthur V. Hedman,** Die Room Foreman, **Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.,** Palmer, Mass., concluded the Ferrous Division sessions with a paper on "Pressure Lubrication of Wire Dies—A Practical Application."

NON-FERROUS TECHNICAL SESSIONS

Joint Non-Ferrous Meeting Tuesday Morning, October 14

SYMPOSIUM ON ELECTRICAL TESTING

Alexander A. Kerr, Superintendent of Production, Electrical Wire Div., **John A. Roebling's Sons Corp.,** Trenton, N. J., was the Moderator for this Symposium, in which seven panel members were scheduled to speak. The papers presented were as follows:

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"Value and Application of Sparkers," by **Gordon Bamber, Phillips Electrical Co., Ltd.,** Brockville, Canada.

* * *

"Spark Testing—Continuous Inspection Tool," by **Harry B. Slade,** Research Engineer, **The Okonite Company,** Passaic, New Jersey.

* * *

"Maintenance and Testing of Wire Sparking Equipment," by **John W. Huether,** Canada Wire & Cable Co., Ltd., Toronto, Canada.

* * *

"An Analysis of Spark Testing Systems," by **Joseph E. Byrnes,** Wire and Cable Dept., General Electric Co., Bridgeport, Conn.

* * *

"Some Notes on Spark Testing," by **James L. Entwistle,** President, James L. Entwistle Co., Cranston, R. I.

* * *

"Electrical Spark Testing," by **J. K. Gillett,** Entwistle Manufacturing Corp., Providence, R. I.

* * *

"Spark Testing with High Voltage D. C.," by **Stephen S. Peschel,** President, Peschel Electronics, Inc., Paterson, N. J. (Note: This paper was not presented, although scheduled, due to the inability of the author to be in Atlantic City on this date.)

SYMPOSIUM ON HIGH SPEED DUAL TAKE-UPS

Non-Ferrous Division Tuesday Afternoon, October 14

Alexander A. Kerr, who had been the Moderator for the Symposium on Electrical Testing in the morning, served in the same capacity for this symposium, at which four papers were given.

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Philip C. Greene, Sales Manager, Davis-Standard, Division of Franklin Research Corp., Mystic Conn., delivered a paper entitled "Design Requirements of High Speed Take-Up Operation."

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"The High Speed Dual Take-Up" was the subject of the next paper, which was presented by **O. Minardi,** Chief Engineer of the **Entwistle Manufacturing Corp.,** Providence, R. I.

Harry J. Bates, Application Engineer, **Reliance Electric and Engineering Co.,** Cleveland, Ohio, presented a paper, "A Coordinated Wire Coating Line."

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B. K. Bigland, Chief Engineer, Wire Machinery Division, **General Engineering Co. (Radcliffe) Ltd.,** Radcliffe, Lancs., England, was the author of the fourth paper, the title of which was: "Some Aspects of Dual Take-Up Economics and Design."

Non-Ferrous Technical Session Tuesday Afternoon, October 14

This session was devoted to papers on insulating materials used in the production of electric wire and cable. **James S. Higgins,** Plant Engineer, Copper Div., **Walker Brothers,** Conshohocken, Pa., conducted the meeting as Moderator.

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B. H. Krevsky of the New Products Engineering Dept., **Bakelite Company,** New York, N. Y., opened with a presentation on "High Density Polyethylene for Insulation." Next was a paper "Wire Insulation of Teflon® FEP-Fluorocarbon Resin—Properties and Fabrication," written jointly by **Robert S. Lovett,** Electrical Applications Technologist, and **Robert E. Stabler,** Product Technologist, Polychemicals Dept., **E. I. du Pont de Nemours & Co.,** Wilmington, Del.

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The third paper presented was by **J. W. Lechleider** of the **Bell Telephone Laboratories,** Murray Hill, N. J. It was entitled "Preheating Conductors in Extension Insulating Processes by Copper Loss Method: Temperature is a Function of Current." The final paper by **J. H. Heiss** and **V. L. Lanza, Bell Telephone Laboratories,** Murray Hill, N. J. was on "The Thermal Embrittlement of Stressed Polyethylene."

Non-Ferrous Technical Session Wednesday Morning, October 15

This meeting, concerned with matters bearing upon power cable manufacture, was moderated by

John C. Murray, Jr., Vice President of **Crescent Insulated Wire & Cable Co.,** Trenton, N. J.

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H. L. Wuerth, Manager of Wire and Cable Materials, **B. F. Goodrich Chemical Co.,** Cleveland, Ohio, was first on the program with a paper on "The Performance of Vinyl Insulation Rated for 75°C THW Service." **F. W. Wurtzell,** Central Zone Manager, **Bakelite Company,** Chicago, Ill., then gave a paper on "Polyethylene for Overhead Line Wire."

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The third paper delivered was by **Michael M. Suba,** Sales Manager, Extrusion Materials Div., **Bakelite Company,** New York, N. Y. His paper was "Polyethylene for Power Cables." Last, but not least, **Harold W. Adams,** Production Supervisor, Electrical Conductor Products, **Reynolds Metals Co.,** Louisville, Ky., gave a paper that discussed the "Fabrication and Properties of 5005 Aluminum Alloy Cable for Overhead Power Cables."

Non-Ferrous Technical Session Wednesday Morning, October 15

Simultaneously with the power cable session, another Non-Ferrous session devoted to the manufacture of communication wires was held, for which **Marshall V. Yokelson,** Research Metallurgist, **General Cable Corp.,** Bayonne, N. J., served as Moderator.

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The papers for this meeting included an initial presentation on "Plasticized Polyvinyl Chloride for Retractile Cords," prepared by **J. B. De Coste, J. B. Howard, V. T. Wallder** and **H. M. Zupko,** all of **Bell Telephone Laboratories,** Murray Hill, N. J. **Charles L. Erickson,** Development Engineer, and **Grady Walker,** Production Engineer, **Western Electric Co.,** Buffalo, N. Y., gave a paper on a recent W. E. development: "Inclined Enameling Machines for Coating Fine Gage Wires."

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A. P. Jahn and **G. N. Vacca, Bell Telephone Laboratories,** Murray Hill, N. J., followed with a paper "Accelerated Aging Tests in Service Performance of Neoprene Jacketed Drop Wire." The session wound up with a paper by **D. H. Bodle, Bell Telephone Laboratories,** Murray Hill, N. J. on the subject of "Tests to Evaluate the Lightning Behavior of Telephone Wire and Cable Insulation."

THE ANNUAL LUNCHEON of The Wire Association Wednesday Afternoon, October 15

This colorful annual feature of our Conventions, graced by the presence of many lovely ladies who had come to Atlantic City with their menfolk, opened at 1:00 P.M. o'clock. When the business of enjoying a delicious luncheon was relegated to history, President Girdler addressed the group briefly, calling attention to the great strides made in the membership of the Association over the years, the improvement in the quality and number of papers presented, and the generally more satisfactory conventions held in recent years.

Awards

David M. Schmid, President of **Techalloy Company, Inc.,** Rahns, Pa., as Chairman of the Medal Awards Committee presented the Medal Awards and Allan B. Dove, Product Development Metallargist, Steel Company of Canada Ltd., Hamilton, Canada, presented the Certificates of Honorable Mention to those qualifying for the best papers presented in 1957, each presentation being accompanied by a cash award also. Awards were made as follows:

Medal Award (Ferrous Division) to Dartrey Lewis, Chief Eng., Research & Development, John A. Roebling's Sons Corp., Trenton, N. J., for his paper: "Combined Hot Rolling and Patenting of Rod."

Medal Award (Non-Ferrous Division) to Clement C. Lawson, Plant Facilities Engineer, Bell Telephone Laboratories, Inc., Murray Hill, N. J., for his paper: "Buried Distribution of Telephone Circuits."

Certificate of Honorable Mention (Ferrous Division) to E. Jefferson Crum, R. H. Miller Co., Homer, N. Y., for his paper: "The Coreless Coil—A New Wire Handling System."

Certificate of Honorable Mention (Non-Ferrous Division) to A. A. DeFoe, Chief Eng., Electrical Conductor Engineering Dept., Aluminum Laboratories Ltd., Kingston, Ont., Can., for his paper: "Oxide Coatings on Aluminum Wire."

25-Year Certificates

Following this, those who had become twenty-five year members in 1958 were presented with suitably engrossed certificates marking the achievement. These were given to the recipients by **Leslie C. Whitney,** as Chairman of the Board of Past Presidents. They were:

H. M. Brightman, Chief Engineer
Columbia Steel & Shafting Co.
Carnegie, Pa.

Leonard C. Crewe, Jr., President
Maryland Fine & Specialty Wire Co.
Cockeysville, Md.

Edward J. P. Fisher
Wire Mill Consultant
Fisher Associates
New York, N. Y.

Moss A. Kent
Management Consultant
White Plains, N. Y.

Harry L. Kitselman, Vice Pres.
Indiana Steel & Wire Co.
Muncie, Ind.

John Rigby, Director
John Rigby & Sons, Ltd.
Bradford, England

Ralph B. Roth, Vice Pres. & Secy.
The Ludlow Saylor Wire Cloth Co.
St. Louis, Mo.

The Mordica Memorial Lecture

President Girdler then introduced the principal speaker of the day, Mordica Memorial Lecturer **David Dwight Buchanan,** who retired last October as Division Manager of the Union Drawn Steel Division of Republic Steel Corporation at Massillon, Ohio. Mr. Buchanan, who had completed 54 years of service to the steel industry at that time and who had been a director for many years and a past-president of the Association, spoke on "What The Wire Association Means to You—and What is Ahead." His lecture appears elsewhere in this issue (January, 1959).

* * *

This lecture is given as a tribute to **John Mordica** and to memorialize him as the Founding President and Honorary President of the Association until his death. The As-

sociation members chosen to deliver the Mordica Memorial Lecture are considered to be distinctly honored and the lecture given is eligible for no other recognition.

The Annual Meeting of Members of The Wire Association

This meeting was called to order by President Girdler at 4 o'clock, October 15, 1958.

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There being many more than a quorum present, it was moved, seconded, and passed that the Executive Secretary dispense with the roll call.

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Mr. Brown read the minutes of the last meeting and then the Treasurer's annual report. Each report was duly approved separately.

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Mr. Girdler called attention to the meetings scheduled for 1959—regional meetings in Boston, Mass. (Electric Wire and Cable Division); in Houston, Tex. (Ferrous Division); and in San Francisco, Calif. (both divisions) and the Annual Convention in Cleveland, Ohio, in October. He stated that as the By-Laws provided for only one regional meeting in the Spring in the East, the Board of Directors had authorized the additional meeting in Boston at its meeting on Monday.

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He then announced that **John Rigby,** Director of **John Rigby and Sons, Ltd.,** England, had been selected as the 1959 Mordica Memorial Lecturer.

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He stated that the Directors had discussed the matter of attendance at the Annual Luncheon and, to study ways and means of making the program for it more attractive, had referred it to the Board of Past Presidents under the chairmanship of **Leslie C. Whitney** for recommendations to be made to the Board of Directors at the next semi-annual meeting in the Spring. Comments and opinions from members were heard, all of which are to be taken under advisement by Mr. Whitney and his committee.

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Mr. Girdler then called for a motion to ratify the acts of the Officers and Directors for the period from October 1, 1957 to September 30, 1958. The motion was made and duly passed.

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Mr. Girdler said that twelve years ago, when he had little to do with wire, Mr. Buchanan had induced him to become a member of the Association. In these twelve years, he said, he had enjoyed everything he had done—being on program committees, running a regional meeting, and an Annual Convention. He had derived much satisfaction from his work as Director, Vice President, and finally as President. He stated that he had made many fine friends, was greatly appreciative of all the help everyone had given him, and that as a Past President, he hoped to attend future meetings and was looking forward to long years of additional conventions. He then turned the meeting over to the President-elect, **Allan B. Dove.**

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Mr. Dove stated that he appreciated the honor conferred upon him—the first non-U.S. resident to be made President of the Association — and said he was gratified by the number of people who had turned out for this meeting of members and was glad to have heard the many suggestions made by them.

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He said that we all owed a vote of thanks to the retiring president and to the many others who had worked so diligently to bring the Association along to its present status.

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A discussion followed on the large number of men connected with supplier firms who had not registered. The suppliers, it was felt, were an essential part of the set-up, but their registration of all men is essential to the meeting of the Convention overhead. The matter is to be considered further at the next Board meeting to establish rules to govern the situation. Most of the larger suppliers, it was noted, registered all of their men.

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Mr. Dove then called for a motion expressing the thanks of the members to the 1958 program committees who so ably had arranged for the papers for this meeting—Mr. Worth, Mr. Lewis, Mr. Lawson, and their respective committees. Mr. Potter made the motion, which was carried.

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Mr. Crew presented another motion that this body go on record as appreciating the fine job performed by the outgoing officers, particularly Mr. Girdler, under whose administration the aims of the Association had been advanced so tremendously. This motion was put and carried.

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Mr. Worth rose to express his appreciation for the vote of confidence. Getting up the program was not a one-man job, and he had relied heavily on his chairmen and their committeemen, to whom, he said, he wanted to extend his personal thanks.

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There being no further business, the meeting was duly adjourned at 4:45 o'clock.

The Plant Inspection Tours Ferrous Division

Buses left the hotel about 9:00 A.M. for the 75-mile trip to Roebling, N. J., where those whose interests were concerned with ferrous matters visited the Steel Wire Mills Division of **John A. Roebling's Sons Corporation.** While the distance was greater than for any previous plant inspection trip, the arrangements worked out under General Program Chairman Worth's direction resulted in a very efficient handling of the tours.

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One of the highlights of the steel plant tour was the opportunity to observe the operation of the new wheelabrator shot blast rod de-

scaler, that had been described by **Donald White** in a paper on the subject earlier in the week. Roebling's visitors evinced much interest in this equipment.

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They also were able to see the conventional acid pickling installation in the cleaning house and could note the greater space and man-power required to operate this older descaling method. From there the visitors went through the extensive wire drawing department, perceiving what seemed to be acres of floor space occupied by batteries of Vaughn drawing equipment. The inspection gave an opportunity to see both the dry and wet drawing of a variety of grades and sizes of steel wire, a considerable quantity of which was in high carbon ranges.

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Galvanizing coating and testing was observed, and the methods of wire packaging was of considerable interest. Tire bead wire, for example, was packaged in tightly packed coils for shipping without a reel, the wire being coiled onto a disposable core. The inspection and labeling of certain grades of wire proved to be of interest to many.

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The guides who conducted the small groups were so well-versed in the various manufacturing operations that visitors were able to have their questions answered satisfactorily.

Non-Ferrous Division

Those persons interested in electrical wire and cable took other buses from Roebling to the company's Buckthorn Plant in Trenton.

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The same procedure of small groups (6 to a group, in fact) was followed at Trenton, each group provided with a competent guide.

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First on the program was a tour of the new magnet wire plant. While no wire drawing is done here, copper wire of many sizes drawn at Roebling, N. J., is processed into a great variety of types of magnet wire, which includes its insulation.

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From there, visitors walked to other buildings where much new equipment was observed in operation in the manufacture of electric cable. These points included a new Syncro taping machine for the application of as many as 64 layers of paper tape to a cable. New Robertson continuous lead presses, with a device for the continuous checking of sheath concentricity, was a matter of interest.

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A mammoth Watson planetary cabling machine evoked much comment. This machine, which can accommodate 3 to 5 main bobbins, is able to produce much longer lengths of cable than was heretofore possible. Provision for smaller bobbins was built into the machine for the manufacture of gas-filled low and medium pressure power cables.

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Among the newer pieces of equipment is a No. 11 Banbury mixer that will handle 500 to 600-pound batches of rubber. It is equipped with a new type of tubular strainer, which provides greater uniformity and better quality in the insulating material.

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Many other standard operations were seen, including extruding, braiding, vulcanizing, and the like.

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Following the tour, visitors were returned by bus to Roebling, where they joined the ferrous group for luncheon at the American Legion Hall. After lunch many of the party were taken direct to the railroad station or the airport, the balance being returned to Atlantic City. The handling of the plant tours and the transportation were gratifyingly satisfactory, and Roebling's management responsible for it is to be congratulated for the efficient planning of arrangements to take care of the guests.

The Ladies

Concurrent with the plant visitations, a trip for the ladies had been arranged, which took them to Princeton to see the University there, winding up with a pleasant luncheon at the Princeton Inn. They came back to Roebling, N. J., afterwards, where they joined their menfolk and either left for their respective homes or Atlantic City, as desired.

The Program Committee

The stupendous job of arranging for papers and other details for this, our biggest meeting, was successfully handled by a small, but effective group of men:

GENERAL PROGRAM CHAIRMAN

Raymond S. Worth
Manufacturing Mgr., Wire Mills Div.
John A. Roebling's Sons Corporation
Trenton, N. J.

FERROUS DIVISION

Chairman

Dartrey Lewis, Chf. Eng., Research & Development
John A. Roebling's Sons Corp.
Trenton, N. J.

COMMITTEE MEMBERS

Reginald S. Brown, Tech. Dir.
Rylands Brothers Ltd.
Warrington, England

Walter O. Everling, Dir. of Res.
American Steel & Wire Div.
United States Steel Corp.
Cleveland, Ohio

Stewart S. Gray, Asst. to Vice Pres.
Union Wire Rope Corp.
Kansas City, Mo.

William Mohr, Works Mgr.
The Colorado Fuel & Iron Corp.
Oakland, Calif.

A. M. Reeder, Met. Eng.
Jones & Laughlin Steel Corp.
Pittsburgh, Penna.

NON-FERROUS DIVISION

CHAIRMAN

Clement C. Lawson
Plant Facilities Engineer
Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

COMMITTEE MEMBERS

Charles M. Fredrickson, Tech. Dir.
Southern Electrical Co.
Chattanooga, Tenn.

J. K. Gillett, President
Industrial Equipment Co.
Englewood, N. J.

John C. Murray, Jr., Vice Pres.
Crescent Insulated Wire & Cable Co.
Trenton, N. J.

H. S. Spaulding, Tech. Supt.
Kaiser Aluminum & Chemical Corp.
Newark, Ohio

(*Please turn to page* 118)

Proceedings of the Annual Convention of The Wire Association

October 13-16, 1958

Atlantic City, New Jersey

These proceedings are a digest of the discussions recorded following the delivery of the papers at technical sessions. Where there was no discussion, no reference is made to a paper. All papers were published in the October, November and December issues of Wire and Wire Products, except for some symposium papers, which will be published in 1959.

FERROUS DIVISION DISCUSSIONS

Tuesday Morning, October 14, 1958

MODERATOR

Charles H. Williams, Jr., Supt.,
Rod & Wire Mills
Pittsburgh Steel Co., Monessen, Pa.

PAPER: "Mechanical Descaling of Wire Rod in England," by H. F. Sanderson, Wire Mill Manager, Frederick A. Power & Sons Ltd., Saltley, Birmingham, England.

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The speaker was asked if there was any significance in the relation of the diameter of the rod to that of the rolls. Mr. Sanderson said they used 6" diameter rolls on No. 5 (7/32) rod.

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Another question was on what the physical arrangement of the rolls was in a multiple roll scale-breaker, to which he replied that the 12 rolls were staggered with 6 in one plane and 6 in another, somewhat like straightening roll arrangement. 3 rolls in each plane are adjustable.

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On the effect of oxidation as compared with fresh scale, he observed that they did not retain rods in storage long enough to rust. He said an Australian engineer had told him that their descaled rods arrived rusted, but this had presented no problems, unless a "canker" had formed (over rusting).

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Regarding nickel or chrome plating of wire drawn from mechanically descaled rod, he said they had not had any experience as they only descaled their patented wire. On this they noted no difference between mechanically cleaned and acid pickled rod. At first, Mr. Sanderson said, they had a tendency to over-lubricate, and this caused difficulty in galvanizing. When the lubricant was reduced, the galvanizing and plating work was successful on mechanically descaled surfaces.

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A member asked for information on the method of applying lubricants and about the first die following the scale-breaking rollers. Mr. Sanderson said they presently used a pressure tube ahead of the die face and the wire (or rod) carries the lubricant into the die, the lubricant being in a fine granular form, the chemical formulation of which he did not know.

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There were no questions relating to other papers delivered during this session.

Wednesday Morning, October 15

MODERATOR

Stewart S. Gray, Asst. Vice Pres.
Union Wire Rope Corp.,
Kansas City, Mo.

PAPER: "Pressure Lubrication of Wire Drawing Dies—A Practical Application," by Arthur V. Hedman, Die Room Foreman, Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp., Palmer, Mass.

Asked whether the system was used in single hole or continuous machines, Mr. Hedman said "in both," not just for the ripper dies, but in all. A member commented that this would result in winding up with more lubricant on the wire, to which he agreed. As to its effect on plating, he said it would be bad if you only used dies for cleaning the wire. The member suggested that it might be better to use pressure lubrication on the ripper die only and not on the dies that clean the wire.

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Asked if other plants used pressure lubrication, Mr. Hedman said that at least two were using identical set-ups. To a question on the length of the drawing tube, he said they had not experimented along these lines and, using existing equipment, had found a very short die plug satisfactory and that they utilized only standard dies.

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As Mr. Hedman had said the lubricating plugs were stocked in steps of .025", a questioner wanted to know whether variance in clearance between the die and the plug would start distorting the die holder because of insufficient clearance, making it impossible to get any real advantage in this lubricating system. Mr. Hedman said they adjusted the plug sizes to their technique and had found that plugs with .025" increments came very close to their standards and could be adjusted to any draw

size selected. He said they had had some trouble with holder distortion. If the guide plug is too small, you draw on it and the internal pressure of the lubricant would be great enough to fracture the entire unit. They've had it happen and have even experienced damage to the machine parts.

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As to the relation of the clearance to the wire diameter, he said 10 to 15% was good. A comment that the system had been used on wet drawing in England, drew the response that they had not tried it. Others were asked about it, but there was no one present who could advise on it.

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PAPER: "Experimental Prestressed Concrete Highway — An Engineering Report," by Carleton W. Garrett, Metallurgical Engineer, Jones and Laughlin Steel Corp., Pittsburgh, Penna.

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Asked whether they would switch from strand to wire as a solution to the cost problem and would this switch result in creep, so that the prestressed feature was lost, Mr. Carleton replied that if the tensile strength is maintained and 60% of it was not exceeded, creep would probably remain at a safe minimum. In the slab shown in the picture, only 51% of the tensile strength was used and there was no creep whatsoever. He referred to Dr. Everling's paper two years back, which supported this idea.

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As to whether bare or coated wire was used, he said the strand was bare and they had used the grouting system to prevent oxidation after the strand was in place. The strand was stress relieved after stranding.

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PAPER: "Spooling of Fine Wire," by Raymond O. Hallberg, Genl. Supt., and Fred J. Locke, Chief Process Eng., Wilbur B. Driver Co., Newark, N. J.

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Mr. Locke was asked whether the 40% back tension was applied on the original spooling or on the respooling operation and whether he would use the same percentage on their Evanohm alloy.

He said they applied it on the respooling mostly, so that the figures given in the paper were for the final spooling. Some of the strains would be excessive in a reeling operation where the material is at a high temperature as it would have a lower strength—the figures apply only to a cold operation. As to different alloys, in every case the percentage is related to the yield of strength of the alloy and consequently would vary.

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A member wanted to know if there was any change in the ballooning tension as the wire moved from one end of the traverse to the other. On this, Mr. Locke said it was not to such degree that it affects the operation and their tension meter, which measures from 1 gm. to 250 gms., did not show any noticeable change from one end of the traverse to the other.

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PAPER: "The Spooling of Fine Wire," by Raymond O. Hallberg, General Superintendent, and Fred A. Locke, Chief Process Engineer, Wilbur B. Driver Co., Newark, N. J.

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Dr. Erwin J. Saxl, President of Tensitron, Inc., Harvard, Mass., who was not able to be present at the Convention, read this paper and prepared some comments on it that provide additional information on the subject of spooling fine wire. His written comment follows:

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"**In** this fine paper the important relation is brought out between tension and wire diameter. The writers are to be congratulated upon their design of new and improved spooling mechanisms and for their grasp of some of the physical conditions that underlie proper tensioning and spooling of fine wires.

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"A great deal of know-how in ballooning is existent now in the **textile** industry. Yarns, during their spinning, throwing and other yarn preparatory processes, are subject to ballooning. Many facts from air resistance to yarn stiffness, from the relative geometric position of the several yarn guides to the speed of operation, are some of the other known factors that influence ballooning. It may possibly be to the advantage of the fine wire industries to avail themselves of this existent knowledge that is already developed elsewhere.

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"**The** critical tensions on wires, alas, are defined by a relation somewhat more sophisticated than 25 X d^2. Not only do material constants enter in terms of tensional characteristics, but also bending, moment of inertia, shock loading, and several dynamic relations. The d^2 relation offered is one of mass only. It is a start in the right direction outgoing from which we may get data that describe the phenomena encountered more accurately.

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"**When** one measures wire tension with Tension Meters, regardless whether they have a mechanical shunt or other means of sensing, one registers the deflection of a length of loaded wire. This yieldingly elastic deviation from the straight path of the wire involves design constants which require compensation for different tension readings in terms of the several material parameters of the wire measured.

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"**To** take just one example, the deflection of the wire in terms of its stiffness involves the bending moment, the moment of inertia and the modulus of elasticity as given by

$$M = E J \frac{d^2 y}{d x^2} \qquad (1)$$

"Here x and y in inches are the abscissa and ordinate respectively of a point on the neutral axis of the wire,

J in inches is the moment of inertia and

E is the modulus of elasticity of the material in pounds per square inch.

For a given point, M is then the moment of inch pounds at that point.

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"**Add** to this the apparent tension of a wire as influenced by its annealing, the history of drawing while passing through the wire preparatory operations, the con-

tent of minor additions such as Tellurium (to influence tensile strength and hardness) and we find that no simple d^2 function any longer fulfills the requirements for the many factors that influence the measurement and control of tension.

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"**Particularly** in dealing with copper wires and materials for the control of ohmic resistance, we are concerned also with their state of annealing. This factor alone can vary within 300%. Aside from annealing there are the small additions of Tellurium and other alloying percentages of copper which can greatly influence stiffness, surface friction, resistance to bending and elastic recovery therefrom.

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"**Adequate** consideration must be given, therefore, to the other parameters that influence the tension as applied ultimately to the coil and which go beyond the crossectional area of the wire or the spool on which it is wound.

"**Here** again reference may be made to the textile industry which has long ago recognized the important differences between gradual loading and dynamic load applications. May we refer in this connection particularly to the outstanding paper by **Jack C. Smith, Frank L. McCrackin** and **Dr. Herbert F. Schiefer** of the National Bureau of Standards. It is entitled Stress/Strain Relationships in Yarns Subjected to Rapid Impact Loading and appeared as Research Paper No. 2866 in Volume 60, No. 5 of May 1958 in the Journal of Research of the National Bureau of Standards.

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"**If** impact loading is of great importance already in the field of textile fibers, it is even more accentuated by the more brittle material that has the physical constants of wires. Thus the fact deserves consideration that wires are bent between the serration on the static magnetic tensioning wheel made by General Electric, with which Hallberg and Locke worked. This plastic wheel inserts a crimp into the wires which then has to be straightened out by subsequent pulling unless it is set beyond repair. This crimping of the wire and its mechanical hysteresis after deformation, to mention just a few factors caused by that wheel, do influence the tension with which the wire is ultimately delivered to the wound coil. True tension engineering has to consider the **entire** history of the wire.

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"**This** interesting paper has made a valuable start in the right direction. The writers are to be congratulated upon the fine work that they have done. It is hoped that future research will go beyond the structure of the winding spool and include beyond the square of the diameter also such other material constants as well as dynamic factors that influence tension and thus the precision and quality of the wound product."

DISCUSSIONS
NON-FERROUS SESSION

Tuesday Afternoon, October 14, 1958

MODERATOR

James S. Higgins, Plant Engineer
Copper Div., Walker Bros.,
Conshohocken, Pa.

PAPER: "Some Recent Applications of High Density Polyethylene," by B. H. Krevsky, New Products Engineering Dept., Bakelite Co., New York City.

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Asked what their tree wire was, the speaker said there were several types, the ones on which most test results were secured being those with a stranded aluminum conductor, with 5/64ths and 10/64ths insulation, the details regarding which are in the paper.

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In the DGDA-5100 compound, a member asked, is the polyethylene compounded? Mr. Krevsky said it is compounded with an antioxidant and is a processed material, not a base resin. As to the carbon black content, he said they added the normal amount used in telephone sheathing compounds. It extrudes easily, whereas a high molecular weight material presents some extrusion difficulties.

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A member commented that there was some concern about the environmental cracking of linear polyethylene, asking what his compound's properties were in this respect. He was told that a comparison had been made between the DFD-2005 and the new high density material. The value of .2 hours in the linear stress cracking test is the same as on the low density polyethylene compounds now used for line and tree wire, which appear to be used without stress cracking difficulties. The high density materials shown are superior, though not perfect, and it can be assumed that they will function just as well in the field.

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How about the compound with a lower melt index, he was asked. He said that in this case they get anywhere from 48 to 100 or 200 hours in the test. Incidentally, he said, extrusion can account for some stress cracking failures and proper extrusion is a necessity with high density materials, since these materials built in strains more readily than the low density products, being more rigid.

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As to shear strength, a member asked if the designation was the same. The answer was that it is a punch test, a circular disc being punched out of a sheet, the energy to force the punch through being measured.

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Another question as to the advantage of the new material on high voltage cable applications drew the response that it was not

thought to be superior, but equal to low density materials in performance. The advantage is a safety factor in melting, which is not of too great importance in high voltage work unless the conductor heats up.

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The same questioner asked about deformation resistance and was told that again extruding probably had some bearing on it, but there would be little direct advantage over low density types.

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PAPER: "Wire Insulation of 'Teflon'(R) FEP-Fluorocarbon Resin: Properties and Fabrication," by Robert S. Lovett, Electronic Applications Technologist, and Robert E. Stabler, Product Technologist, E. I. du Pont de Nemours and Co., Wilmington, Del.

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A question as to the probable cost of the resin in 1961 was posed. The present price, Mr. Stabler stated, was $19 a pound, and this may be reduced when it is produced on a commercial basis. Long range prices cannot be given. The material is a two-component one, a copolymer, and is basically more expensive than the TFE resins. It will remain more expensive than Teflon. There are no plans for offering it as a dispersion.

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The Fiber Department now is offering it in a range of thickness of from one to three mils.

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Asked whether the 700 degrees mentioned in the paper was extruder or compound temperature, he said it is the stock or compound temperature. The same man asked about the 10 to 1 shrinkage ratio. Mr. Stabler said it is only a "ballpark" ratio. They have quoted a draw-down area of 100 to 1, which would give the 10 diameter ratio. They have gone as high as 175 to 1 on draw-down with no trouble, but for most extrusions, 100 to 1 is a good range. The best rates to use depend on a particular construction.

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PAPER: "Preheating Conductors in Extrusion Insulating Processes by the Copper Loss Method," by J. W. Lechleider, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

The speaker was asked if any of this work was valid for aluminum. He said it was if the middle formula was used, which has the actual logarithm in it, and even the more approximate formula is satisfactory. The curve given in the paper would have to be converted to aluminum wire, using the approximate formula.

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Asked about the high contact resistance of aluminum, Mr. Lechleider said that if he meant heat generation, the contact resistance was high. Aluminum has an oxide layer on the surface and the emissivity of aluminum is low, so it is possible to neglect radiation; but how much the temperature of the wire would be raised by contact resistance he did not know.

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The preheater voltage used at Murray Hill is about 22½ volts, and the maximum current their device will give is around 400 amperes. It is regulated by a thermostat. For heavier wire, longer lengths must be heated.

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Also, he said, they didn't have to use AC at lower wire speeds. He had mentioned 1900 fpm in the paper but said that at the speeds of 2000, 3000, or 5000 fpm they had been hearing about, serious periodic variations in temperature occurred and as the ratio of frequency to speed went to zero, the variation in temperature along the wire would equal the average temperature rise, and this could be serious. There is a smoothing out process as heat conducts along the wires, however.

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Asked what the best temperature was, he stated that this varied for different insulating materials.

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A member said they had been enjoying the benefits of preheating the wire, but it was not just a simple matter of checking the wire temperature as it entered the extruder and, if incorrect, making a correction. Madison Electric of England, he said, made a temperature measuring device, to which Mr. Lechleider added that automatic control was certainly desirable, but their system did not have it.

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Mr. Lechleider said the nature of the sheaves was important, one factor being the transient effect in starting up. The sheave has to be heated as the amount of copper is small and when the preheater is started, it takes a minute or so to get up to heat. It will vary with different materials in the sheave. Another factor is contact resistance, referred to previously. If aluminum sheaves are used with copper wire, they will give more heat on the wire, but the nature of the sheave is unimportant, provided it is a good conductor and makes good contact with the wire.

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PAPER: "The Thermal Embrittlement of Stressed Polyethylene," by J. H. Heiss and Dr. V. L. Lanza, Bell Telephone Laboratories, Murray Hill, N. J.

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Dr. Lanza was asked if they had checked the effect of 2½% of carbon black in thermal cracking. He said they had done a little work on this, and it was disappointing. They had tried to get very small particles of silica and hoped they could create nucleation centers in the polyethylene and thus grow small sphereolytes, but they had not succeeded. This was done with 96 density polyethylene.

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It was brought out that they had not yet tested the new DGD-4100, discussed by Mr. Krevsky, which apparently showed some improvement in resistance to thermal embrittlement. Another member commented that there appeared to be an advantage in going to a lower melting point. The same man asked what Bell aimed at—2,000, 5,000, 10,000 hours, to which Dr. Lanza said they aimed at infinity, as they had to guarantee long life on all components. He stated that samples which lasted 5,000 hours at 100° could last a long time without cracking at room temperature.

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A member said the Krevsky

samples were fairly comparable to polyethylene, but Dr. Lanza expressed the opinion that the test run on wire in an air oven was a practical one, and whether they were cracked by oxidation or thermally stress cracked, the new Bakelite material was definitely superior.

Wednesday Morning, October 15

MODERATOR

Marshall V. Yokelson, Chief Metallurgist
General Cable Corp.,
Bayonne, New Jersey

PAPER: "Tests to Evaluate the Lightning Behavior of Telephone Wire and Cable Insulation," by D. W. Bodle, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

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Mr. Bodle, as a result of discussions held the day before on electrical testing, said one may wonder why with polyethylene there are lower breakdowns on surge as compared with the DC, a logical theory regarding which is that under applied surges ionization takes place in the air voids which occur in all polyethylene samples. Assuming that there are air voids, the initial breakdown from a surge occurs across the first air voids due to their lower dielectric constant. Then the stress redistributes and becomes greater across the solid sections. In the case of gradually applied potential, there appears to be time enough for the stresses to distribute uniformly and stress the entire specimen, rather than just the specimen minus the air voids. Work along these lines is being carried on by Simplex. A paper on it was given back in 1946 by Eddy and Finn, and a lot of people didn't believe it. They had made tests on 5-foot specimens of #12 wire, and the ratios came out very close to what I have here — identical with respect to DC and surge.

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Mr. Bodle was asked if in the Eddy and Finn paper their ratio of voltage rise was the same as his. He stated that it was quite similar. On AC, they had used 500 volts and on DC, 700 volts. On his tests, he said, they used 500 on both, but while they used 5-foot samples, he had used 8-foot ones. It should have gotten them to higher levels because of the shorter specimen, but didn't seem to. Under similar conditions we related plastic insulation to paper, which told us what type of protection was necessary. It was an empirical procedure—if we found we had insulation that was 30 times better, we started cutting down the insulation.

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Mr. Entwistle, he said, had stated that on spark testing he would use the peak AC value and Mr. Slater had mentioned a ratio of 4 a few minutes later. Both were probably right, as Mr. Entwistle was thinking of an absolute void where the dielectric is air, which gave an approximately similar relationship for the 60-cycle peak and the DC.

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A member said on DC testing Mr. Bodle had made no mention of the polarity of the inner and outer conductors. While he said he had not, a recent paper on ion and electron bombardment had shown a considerable difference in polarity on a specimen where there was an air void between the ion and the insulation, and if the conductor was negative and the insulation positive, it was a bad situation if there was an air void between. He thought that because surge generates output on a negative wave, the water, being a ground potential, would be connected to the positive side of the generator. From an engineering standpoint it made no difference, because lightning generally beclouds the negative discharges, where current tends to leave the plant and go to the cloud as conventional current. The plant is subjected to many plus and minus surges, so that both have to be contended with.

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PAPER: "Plasticized Polyvinyl Chloride for Retractile Cords," by J. B. DeCoste, J. B. Howard, V. T. Wallder, and H. M. Zupko, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

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A question as to whether all the determinations were made at one temperature, was answered by Mr. DeCoste, who said they were made at 23°C. Some studies were made at —20°C, which large difference had quite different effects. The compositions now being used are designed to have a modulus of 10,000 minus 10°C. While they don't like this and would like a much lower one, they are confined to this area.

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PAPER: "Accelerated Aging Tests in Service Performance of Neoprene Jacketed Drop Wire," by A. P. Ja'in and G. N. Vacca, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

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Asked if the new jacket in Florida was deteriorating more than the old jacket that had less carbon black than in the new jacket, Mr. Jahn said he did not think so, but they had less data on the new one in Florida than on the ones in New Jersey and elsewhere, and he hoped subsequent results will bring it more in line with the aging noted in Los Angeles.

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Mr. Yokelson asked what the current was on polyethylene and other wires for telephone drop wire, for which Neoprene was discussed; he wondered about these other materials. Mr. Jahn said they hadn't considered other materials, as there would be some difficulty in getting them past the Underwriters for drop wire. Polyethylene is not only flammable, but it drips. PVC does not have that objection, but economics favor Neoprene.

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PAPER: "Inclined Enameling Machines for Coating Fine Gauge Wires," by Charles L. Erickson, Development Engineer, and Grady Walker, Production Engineer, Western Electric Company, Buffalo, New York.

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Stating that he realized that temperature control of ovens should be as close as possible, a member asked what differentials were maintained in the system described and was told by Mr. Erickson that it was plus or minus 5 degrees.

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Asked about the build-up or increasing diameter per groove on the sheaves, he was told that this

was about .004 inches on both the water sheave and the capstan — not of the enamel on the wire.

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A member said he had not noticed any sign of instrumentation for test purposes on the machine — for pinhole detection or smoothness indication of the finished product. On this he was advised that no testing equipment was connected with the machine as pinholes were not a problem with this particular product. For some of the new types of enamel, testing equipment might be desirable, but there seems to be no need for it with the oleo type.

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Asked how the amount of air in the tubes was determined, Mr. Erickson said they used an orifice of about 0.0625 inches, which had been found ample for the oxidation of the enamel in the tube. It is in the form of a blind gasket in the pipe line. Around 10 to 15 cubic feet of air per hour is fed into the machine, which is actually more than required.

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The speaker was also questioned on the minute film of water on the wire and its possible effect on the ultimate coating, and he said the wire was usually completely dry by the time it reached the capstan, the small amount of salts making no difference, as in oleo-resin type enamel, water doesn't wet the enamel under optimum bake conditions—it just runs off. Water is circulated to keep the temperature down to 40° to 60° and the machine is connected up so closely that if the enamel were not cooled by water, it might stick to the lower sheave.

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Asked if the machine were suitable for formvar enamel, he said it was not; it has worked well on a number of enamels, but its complete uses have not yet been determined.

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Another question on the type of copper going into this wire was answered by Mr. Moyers, who said they were very particular, but that more attention to the wire could probably be given. All copper rod for this wire is shaved. Rods are given lot numbers and this tells when and by whom it was rolled, the number of machines it went through, and the history of the dies used. This also shows the number of breaks per pound by gage. There are many variables in the results caused by copper, compounds, dies, capstans, and machine vibration, and it is hard to say, with so many people working on it, which is the biggest variable.

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A member noted that they used a dry pass and asked why. He was told that it was an empirical matter; they had found over a number of years that it made for better coverage of wire with enamel, but the reason for it had not been determined.

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As to oxidation, an oxide film on the wire has been found to be desirable and beneficial in reducing the liability to pinholes, provided the oxide film is not too thick. A trace, a little color, is gotten on the wire due to this film.

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Asked about the 200-foot speeds mentioned and whether they ran off all the bare wire and then had to restring in putting on the second spool, Mr. Erickson said the spool is not run out; it is stopped. There is a clutch in the machine and when a supply spool is nearly empty, the operator stops that particular head and changes the supply spool, splicing the end from the old spool to the beginning end of the new spool. For this he slides that little tray forward to get the wire up out of the roller groove. The take-up spool is recovered, an empty one put in, then the wire thrown by hand onto the floor until the splice has pulled through, at which time the take-up is started. It is a one-for-one proposition.

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The ovens are run at 500° or better temperatures, it was stated, which generally is higher than for wire coverings other than oleo. In this process the value of annealing has not been determined for this system.

The moderator commented that they had found intermediate anneals definitely beneficial to secure the softest, spring-free enameled wire. Hard drawn wire does not have this desirable softness, which is a mechanical property.

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A member said the artisan approach had been stressed, and he wondered why the oven temperature, viscosity, and other controls could not be made automatic. Mr. Erickson said that in the round type oven it was an art, although the inclined type wasn't as much an art as before, and the operators have become skilled in making adjustments—and even in anticipating adjustments necessitated by things like weather changes, although they are studying and may go into automatic viscosity control. He added that so many gadgets could be added that it would take a Ph.D. to understand and operate the machine.

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On the wire lost if the machine is stopped, he said what was in the oven was burned and this section had to be scrapped.

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As to the number of coats applied, the speaker said they used four dips for both regular thickness and thin coatings. These are wet passes through the tubes.

★ ★ ★

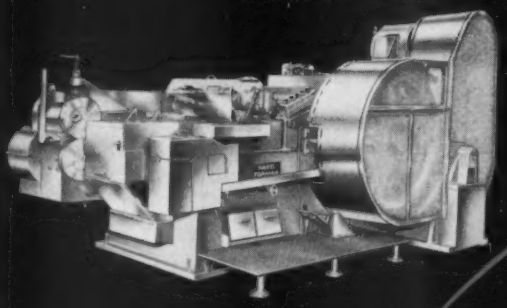
Asked whether there was difficulty in maintaining the 50° differential between the air stream and the tubes, he said the heater supply was to the air stream, which had a fairly high velocity, which is measured. How the air stream temperature varies during a cycle is not known, but it has some dip. A controller on the machine supplies heat as needed, and while the needle may go a little high when full voltage is applied, the tubes act as a buffer, and over a period there is substantially a straight line and no problem is indicated.

★ ★ ★

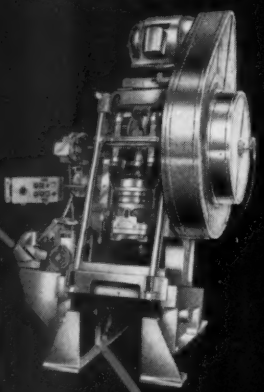
Asked if they have step control —cutting out any heat banks—a

(*Please turn to page* 94)

COLD HEADING
MACHINERY



POWER
PRESSES



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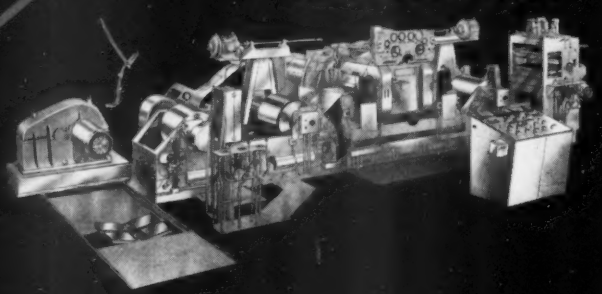

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DIVISION OF TEXTRON INC.
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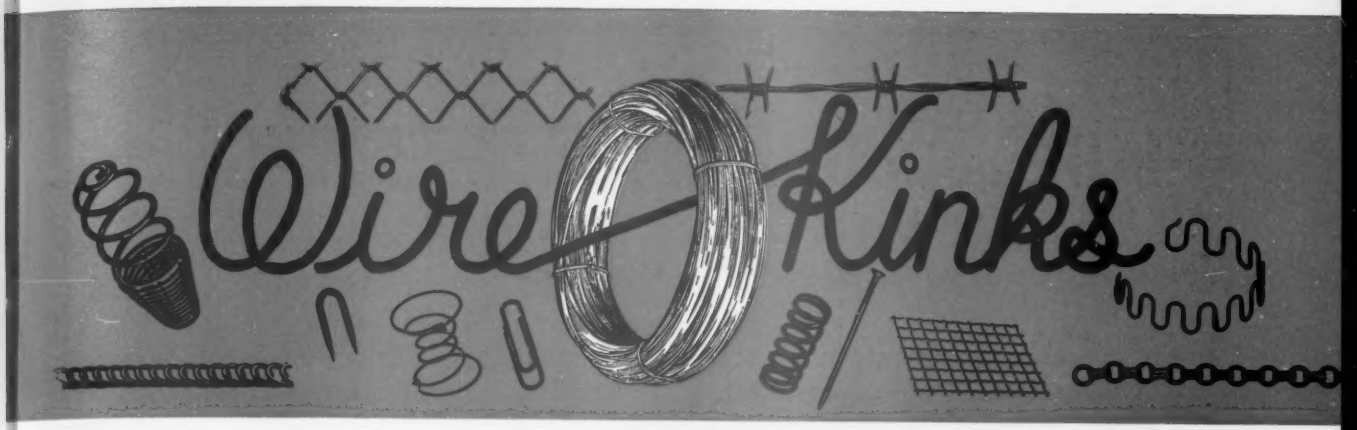
WF-54



This new department is published in response to several requests. It can become a section of real interest if our readers will cooperate in supplying items of interest for it. You are cordially invited to submit ideas on interesting ways of doing things.

Selecting the Right Grade of Nuts

"Workhorse" among nuts is the standard "FINISHED" series. It gives good seating area; sufficient height to sustain high thread tension; enough wall thickness to control elastic nut dilation under load.

★ ★ ★

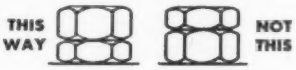
"Heavy" nuts are wider than "Finished" nuts in **all** sizes by only ⅛" across flats. Thus, their value diminishes as size increases. Most effective in ½" to 1½" range, they satisfy applications involving excessive clearance holes, unusual loads, and certain boiler codes.

★ ★ ★

Materials? The regular carbon nut steel (non heat treated). It makes nuts strong enough to pull bolts beyond yield point, lets threads distribute load to avoid stripping.

★ ★ ★

Jam Nuts are made for position locking. Use of two together forms a superior and economical locking device. When used to lock a regular nut, jam nut should be adjacent to work surface. Otherwise, the jam nut takes the load—a job it wasn't designed for.



Use a 2H NUT where high temperatures call for stability.

★ ★ ★

High Nuts are used for shackle, U and tractor pad bolts. They're furnished only in fine threads, therefore, and hardened. More to be recommended are **coarse thread** finished nuts.

—Courtesy of Russell, Burdsall and Ward Bolt & Nut Co.

Winding Wire

The terms "layer wound", "level wound" and "thread wound" are synonymous and refer to the spooling of wire or textile yarns, in which one convolution of the wire or yarn exactly touches the preceding one. This calls for a precise coordination of the traverse guide with the diameter of the filament being wound.

Believe It Or Not, Even Stainless Steel Has Its Faults

Many readers will doubtless be surprised to learn that stainless steel, too, has its faults. This writer has been lauding the new metal rather enthusiastically and he has now learned that it DOES give trouble once in a while. But, not so much as real stainless steel as when it becomes a modified metal.

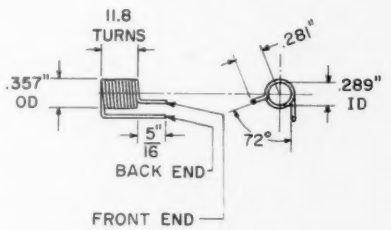
★ ★ ★

For instance, stainless steel makes an excellent lining for tanks. However, during the lining process it is sometimes welded, and that's where the difficulty arises. In the welding process the stainless steel often becomes an altered metal and that portion that is altered sometimes does not stand up as well against acids, corrosion, etc., as does the original metal. So, that is an important thing to guard against. As a result some users are now resorting to other ways in which to join the metal so that its composition will not be altered.

Making Special Electrical Coil Spring

The problem here was to design tooling for forming a spring with squared parallel tails as shown in Figure 1. The material was a nylon coated .034" copper wire.

Figure 1



The front tail had to be formed before the spring was wound. It was accomplished as follows: As the wire arrives at the arbor, the front tool moves in, raises the wire and guides it into the pickup. See Figures 2 and 3. Since it is necessary to hold the spring during the bending of the back tail, the front tool is kept under the arbor during the entire coiling and forming cycle. In Figure 2 can be noted the type of pickup used. The arbor is slabbed to accommodate the vertical front tail.

WIRE ASSOCIATION MEETINGS FOR 1959

APRIL 29-30—NON-FERROUS DIV., ELECTRIC WIRE & CABLE SECTION Regional Meeting: Statler Hotel, Boston, Mass.

Program Chairman: URBAIN J. H. MALO, *Technical Director*, The Crescent Company, Pawtucket, R. I.

MAY 7-8—FERROUS DIVISION Regional Meeting: Shamrock Hotel, Houston, Texas.*

Program Chairman: WILLIAM L. DULL, *Superintendent*, Wire Mill, Sheffield Div., Armco Steel Corp., Houston, Texas.

JUNE 4-5—PACIFIC COAST REGIONAL MEETING, Fairmont Hotel, San Francisco, Calif.

Program Chairman: LLOYD W. ALBRIGHT, *Manager* of Wire and Hardware Sales, Pacific Coast Div., The Colorado Fuel & Iron Corporation, Oakland, Calif.

OCTOBER 12-15—ANNUAL CONVENTION OF THE WIRE ASSOCIATION, Statler Hotel, Cleveland, Ohio. Meeting of all divisions.

General Program Chairman: WALTER B. McSHANE, *Chairman*, Wire Committee, American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

Ferrous Program Chairman: GORDON T. SPARE, *Research Project Engineer*, American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio.

Non-Ferrous Program Chairman: DAVID M. SCHMID, *President*, Techalloy Co., Inc., Rahns, Penna.

*The Semi-Annual Meeting of the Association's Board of Directors will be held at the Shamrock Hotel during the Regional Meeting in Houston, Texas.

o

Full details regarding these meetings will be published in WIRE AND WIRE PRODUCTS in advance. Association members also will receive reservation cards and program data by mail.

All wire men are cordially invited to attend. If not a member, hotel reservation cards will be mailed upon request to Association headquarters.

THE WIRE ASSOCIATION

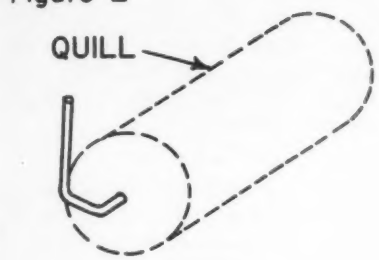
RICHARD E. BROWN, *Executive Secretary*

•

453 MAIN STREET **STAMFORD, CONN.**

Wire Kinks

Figure 2



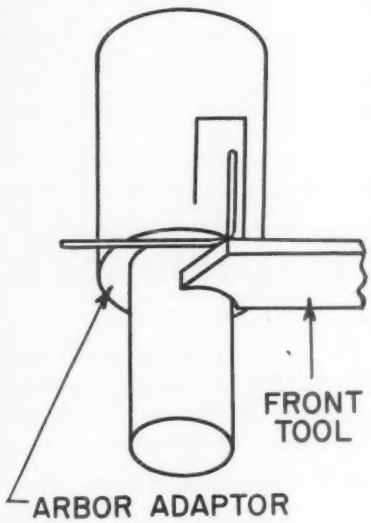


Figure 3

After the spring is wound, the two horizontal slides move, first cutting the wire and then positioning the two holding tools over the separated ends, providing an edge for the two forming tools on the bottom vertical slide to bend the wire to form the back tail.

★ ★ ★

The left horizontal slide and the bottom vertical slide thereupon withdraw, the spring is ejected and the operation is repeated for the next spring. As this was not a standard forming operation, special tooling had to be designed, made, and installed to do this job.

—Courtesy of Machine Division, Torrington Manufacturing Co., Torrington, Conn.

Cold Heading

For a component requiring a large head or collar, cold heading, particularly for large quantities, is not only less expensive, but stronger. As a rule of thumb, when the portion to be upset is 2½ to 4½ times the wire diameter, two blows are required; where it is 4½ to 7 times the wire diameter, three blows are necessary. Multi-blow machines form a cone first, then give the part a forming blow. More than two blows is called progressive heading and may require annealing between operations.

—Courtesy John Hassall, Inc., Westbury, N. Y.

A Lesson in Elasticity For The Wire Plant Worker

Fig. 1 shows a bolt that broke at the root of the last thread. It was used on a wire drawing machine. It broke because it was not sufficiently elastic. And it broke at the root of the thread because that was the weakest point in the bolt.

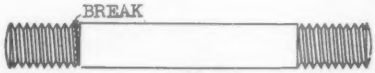


FIG. 1

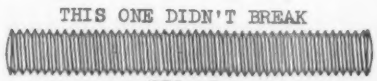


FIG. 2

Fig. 2 shows how the fault was remedied—by threading the entire length of the new bolt. By threading the entire length the total stretch does not concentrate on a single thread as was the case in Fig. 1. In Fig. 2 the stretch is distributed over the roots of all of the threads. As a result the bolt is much more elastic and tougher and less apt to break.

★ ★ ★

Another method is to turn down the shank of the bolt between the threaded ends making the unthreaded portion smaller in diameter. It is a good method, but many wire plants do not possess lathes whereas they very likely do possess threading tools for doing the job as shown in Fig. 2.

Ultra Fine Wires:

Tungsten wire is regularly drawn down to .0008" or .0009" on a commercial basis. It has been drawn to .00022", but not for as a production proposition.

★ ★ ★

Drawing copper wire to .00059" in diameter has been achieved by a German wire concern, with a tolerance of plus or minus .000004". This wire is enameled and used as magnet wire with an O.D. of .000787". One pound of copper at this size will produce 895,000 feet of wire.

★ ★ ★

Gold wire has been coated with another metal and drawn down, and the coating dissolved in acid to produce a residual wire of about .00015" thick. This was a laboratory stunt and has no commercial application.

NEMA's Annual Convention

At its Annual Convention in Atlantic City in November, 1958, The National Electrical Manufacturers Association elected new officers for 1959.

★ ★ ★

Joseph L. Singleton, Vice President of Allis-Chalmers Manufacturing Company, Milwaukee, was chosen for President.

★ ★ ★

Vice Presidents elected were: **A. D. R. Fraser,** President, Rome Cable Corporation; **Frank H. Roby,** Executive Vice President, Federal Pacific Electric Company; **N. J. MacDonald,** President, The Thomas & Betts Company; **Chris J. Witting,** Vice President, Westinghouse Electric Corporation; and **W. R. Persons,** President, The Emerson Electric Manufacturing Company.

★ ★ ★

For the office of Treasurer, **J. R. MacDonald,** Chairman of the Board and President of General Cable Corporation, was elected.

★ ★ ★

In the Wire and Cable Section, **D. E. Allen,** Vice President-Sales, Anaconda Wire and Cable Co., was made Chairman and **Vernon W. Heimberger,** Manager of Electrical Products, American Steel & Wire Div., U. S. Steel Corp., and **H. W. Clough,** Vice President of Belden Manufacturing Co., were elected Vice Chairmen.

★ ★ ★

A spirited two-day session of The Wire and Cable Section was held on November 11 and 12, during which various problems with which the industry is confronted were discussed.

★ ★ ★

J. P. Hamblen, President of the Southern Electrical Supply Co. and of the NAED, made an appeal to individual wire and cable manufacturers to unify their policies, so that customers in any part of the country could be assured of similar treatment.

C. S. Shiffreen of the Philadelphia Electric Company outlined the probable changes that the electric utilities would be facing in the next few years, appealing to the industry to work closely with the utilities to provide types of cables that would meet these future needs.

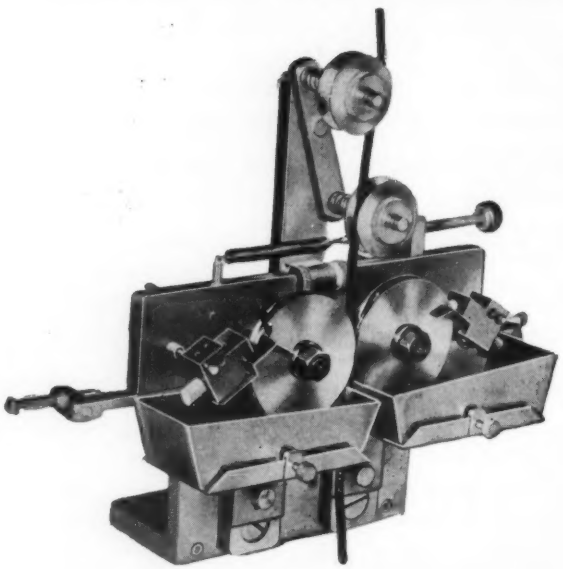
★ ★ ★

Other reports and discussions were concerned with the activities of the Section during the year and with comments on the Insulation Conference held earlier in Cleveland, which in the main was considered good, but for which many suggestions had been received for its improvement.

★ ★ ★

On the final afternoon of the Section's meeting two highly interesting speakers were heard. **C. H. Bartlett,** Vice President of Westinghouse Electric Corp., spoke on "What's Next for the User of Electricity" and **Joe Powell** of the U. S. Department of Defense gave an address on "The Collapse of

MARKING WHEELS and MACHINES for ELECTRIC WIRE



Gillies Engraved Concave and flat marking wheels are widely used printing the I.P.C.E.A. color code, numerical, semi-spiral striped, dating, or manufacturer's identification, etc. on insulated wire, tubing or hose.

Machines print on ONE or BOTH SIDES in large legible letters. Wheels are adaptable to any machine—or we will supply the machines.

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Time—from Muscles to Missiles." Both speakers told of things to come that sounded like a modern version of Jules Verne's visions of the future, yet which in all probability are developments that will become realities in the next ten to fifteen years.

★ ★ ★

Members of the newly elected Advisory Committee, which directs the activities of the Wire and Cable Section of the **National Electrical Manufacturers Association,** were announced today by **D. E. Allen,** chairman of the Section, and president-sales, **Anaconda Wire and Cable Company.**

★ ★ ★

The Committee, which includes Mr. Allen, as well as the Section's two recently named vice chairmen **—V. W. Heimberger,** manager of electrical product sales, **American Steel & Wire Division, U. S. Steel Corporation,** and **H. W. Clough,** vice president, **Belden Manufacturing Company**—follows:

★ ★ ★

H. O. Anderson, vice president in charge of sales, Rockbestos Products Corporation

Herbert B. Bassett, president, The Acme Wire Company

Howard T. Brinton, president, Phelps Dodge Copper Products Corp.

A. M. Callanan, president, Walker Brothers

John R. Cook, president, Warren Wire Company

A.D.R. Fraser, president, Rome Cable Corporation

H. W. Goodman, vice president, Circle Wire & Cable Corporation

C. W. Higbee, assistant general manager, Electrical Conductor Division, Kaiser Aluminum & Chemical Corporation

B. F. Ilsley, general manager, Wire and Cable Dept., General Electric Company

R. S. Keefer, president, The Okonite Company

J. R. MacDonald, chairman of the board and president, General Cable Corporation

Carl S. Menger, executive vice president, Triangle Conduit & Cable Co., Inc.

R. C. Moeller, Jr., president, Collyer Insulated Wire Company

Everett Morss, president & treasurer, Simplex Wire & Cable Co.

E. L. Robinson, vice president, Crescent Insulated Wire & Cable Company

W. J. Shea, executive vice president, Paranite Wire & Cable Division, Essex Wire Corporation

1 DRAWS entry wire to accurate size through carbide dies

2 FLATTENS wire in precision 8" mill with water cooled carbide rolls

3 SIZES AND EDGES SIZES AND SHAPES in versatile Turks Head

4 GAGES thickness with P & W electro-limit gage

5 BUNDLES traverse wound coils, traverse wound spools, loose coils.

PRICE UNDER $35,000
DELIVERY 10 WEEKS

Here is the new Fenn 5-in-1 Wire Line with a price as remarkable as its performance and compactness. It will produce precisely flattened or shaped, edged, and sized bundles at speeds up to 600 FPM in an absolute minimum of floor space. Inlet capacity up to ⅜" diameter. The Precision Fenn 8" Roller Bearing Rolling Mill has carbide shell rolls with internal and external cooling. The entire line operates from a single, infinitely variable speed AC motor with simple electric controls. The 5-in-1 Wire Line is engineered and built to Fenn quality standards. Write for complete specifications.

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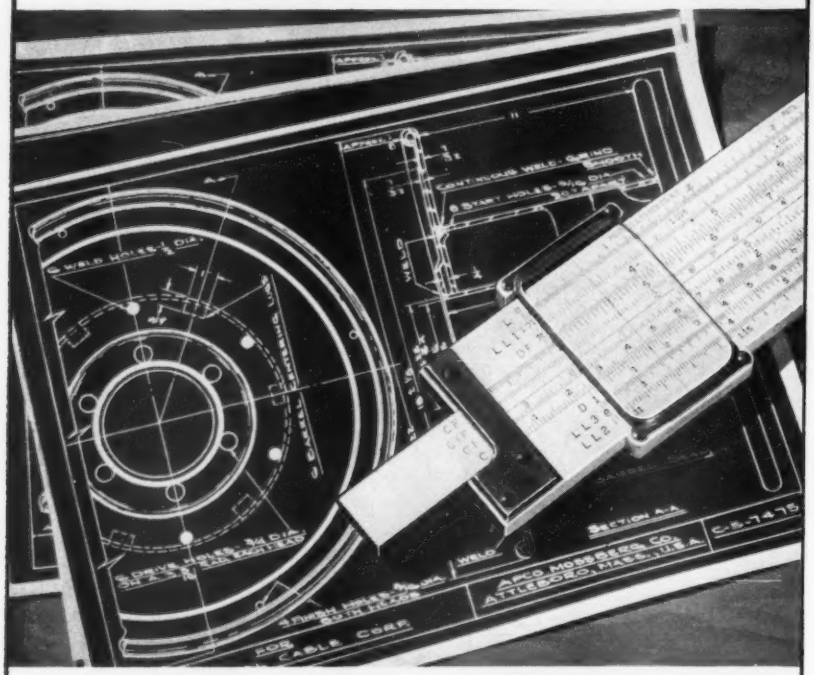
If you draw wire . . .



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for engineered reels, spools and bobbins

A wealth of experience — gained through more than 50 years of service to wire and wire rope manufacturers — makes Apco Mossberg well qualified to fill your complete requirements for steel reels, spools and bobbins.

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Alan F. Sheldon, president, Kennecott Wire & Cable Company
William E. Sprackling, President, Anaconda Wire & Cable Company

★ ★ ★

Approximately 80 persons were registered for the Wire and Cable Section's meetings and about 700 for all Sections of NEMA.

Newsletter on "Wear-In" Damage To New Machinery

Lubrication Newsletter #5, a technical paper covering the effect of lubricants on the "wear in" of new machinery, has been released by **The Alpha-Molykote Corporation.**

★ ★ ★

A thorough engineering study of the surface geometry of mating surfaces is included together with a discussion of Coulomb's theory on friction as applied to the ever-present asperities on machined surfaces.

★ ★ ★

The results of a continuing series of tests on the lubrication of mating surfaces reveal data heretofore unpublished. Test equipment especially developed for this use is presented. Actual test records are pictured and analyzed.

★ ★ ★

Copies of Lubrication Newsletter #5 are available from The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.

Issues Hydraulic Cutting Tool Catalog

The Manco Mfg. Co. has released its new 70-page catalog on special purpose high thrust hydraulic cutting tools. The catalog is divided into nine sections according to the general types of material to be cut, i.e. wire and rod, steel billet, strip, bar, tubing, etc.

★ ★ ★

Included are sections on fabricating, auxiliary power equipment, and optional extras for these hydraulic tools. Each section is headed by typical applications of Manco Guillotines with the various

types of material. Thrust data charts for punching and riveting, as well as recommendation charts for cutting of mild, high carbon, and alloy steel rods are included.

★ ★ ★

Both manual and electrical valve control methods are fully described, as well as multiple tool operation from one power source. To obtain a copy write Manco Mfg. Co., Bradley, Ill.

AWS Issues Specification for Low Alloy Steel Electrodes

The availability of a new booklet on low alloy steel electrodes was recently announced entitled "Specification for Low Alloy Steel Covered Arc-Welding Electrodes." The specification was prepared jointly by the **American Welding Society** and the **American Society for Testing Materials.**

★ ★ ★

The new specification is the result of prolonged study by technical committees. The latest developments were taken into consideration together with industrial requirements and the modifications will be welcomed as a distinct contribution to the welding industry.

New Mechanical Adjustable Speed Drive

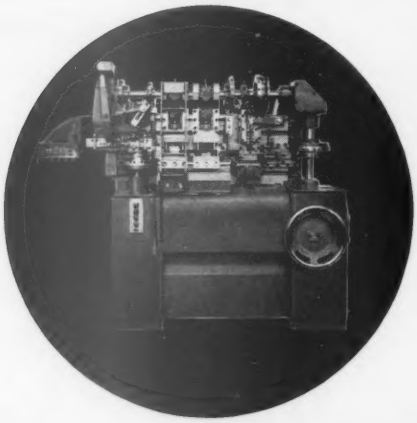
The Louis Allis Co. recently announced a new mechanical adjustable speed drive, called the "Allispede Drive," that offers infinitely adjustable speed over ranges up to 8:1. The drive operates from an A.C. power source and is available in ratings from 1 to 20 HP with output speeds of 1 to 10,000 RPM.

★ ★ ★

The drive is designed for use in such industries as food and chemical processing, machine tool, metalworking, woodworking, paper and textile, and in material handling applications.

★ ★ ★

For complete information request Bulletin No. 3300 from the Louis Allis Co., Dept. P, 427 E. Stewart St., Milwaukee 1, Wis.



VERTICALITY = SETUP TIME / 2

The big story of the important new line of Torrington vertical 4-slides is savings:

Upward of 50 percent savings in setup time, tooling costs and floor space!

On a strict cost-accounting basis, you cannot afford not to investigate the profitability of replacement with the Torrington "Vertical Line" in the cost-critical field of wire and strip forming production equipment. Full data—or a demonstration—upon request.

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Among the more important changes in the specification are the following:

1. **All electrodes now must meet chemical requirements as well as mechanical properties if they are to be listed in an AWS-ASTM electrode classification.**
2. **A new classification has been added which covers electrodes giving a minimum strength of deposited metal in stress relieved condition of 110,000 psi. This classification was introduced to satisfy the demand for an electrode between the E100 Series and the E120 Series. The new classification will be known as the E110 Series.**
3. **New electrodes have been added to Table II, Chemical Requirements, in order to meet the demand for standard electrodes to deposit weld metal having specific properties.**

★ ★ ★

The specification may be obtained for 50¢ per copy from the American Welding Society, 33 West 39th Street, New York 18, N. Y.

"Electricity Builds Jobs", Theme of National Electrical Week

"Electricity Builds Jobs," a program to dramatize the vital importance of the electrical industry to the nation's economy and progress, will be the central theme of National Electrical Week, February 8-14, 1959.

★ ★ ★

The theme announcement was made by **N. J. MacDonald,** president of The Thomas & Betts Co., Elizabeth, N. J., and general chairman of the National Electrical Week Committee, at a meeting on October 10 of representatives of all of the electrical industry's principal trade associations, at which were unveiled the plans and materials developed by the N.E.W. Committee.

★ ★ ★

The Week will provide a springboard for the various educational, public relations, and promotion goals of our industry, focusing attention on the contributions of electricity and the electrical industry to our American economy.

Bulletin on Steel Bars

A new 4-page bulletin has been published by **La Salle Steel Company,** highlighting the recently

announced improvements in their high strength, free machining "Stressproof" Steel Bars. The bulletin reviews new-user benefits resulting from improvements in strength, machinability, and tolerances. These allow for greater cost reduction opportunities and wider use. Physical properties compare with those obtained by heat treating, without the necessity for heat treating, plus machinability 50-100% faster than equivalently hardened alloy steels.

★ ★ ★

For your copy, write the Advertising Department, La Salle Steel Company, P. O. Box 6800-A, Chicago 80, Ill.

New Welding Symbols Issued By AWS

The first major change in welding symbols in recent years has been announced by the **American Welding Society.** The new standard contains many additions and improvements. The number of welding smybols has been doubled due to the increased use of welding. New processes have been developed and new types of welds adopted which necessitate additional symbols to describe them adequately.

★ ★ ★

The new symbols cover those for spot and seam welds made by arc welding; symbols for welds used in aircraft, guided missile and automotive work; and symbols for the types of welds used in structural steel fabrication, reinforced concrete work and the like.

★ ★ ★

A table is included which provides a new system for designating welding and cutting processes by means of letters. The system covers the 37 commercially used welding processes and also provides a means for indicating: automatic welding, machine welding, manual welding, and semi-automatic welding.

★ ★ ★

The charts are prepared in two sizes: one for wall use listed at $1.50 and the other, a smaller replica listed at 50¢ for desk use. The

For Moisture Resistance, Specify

TEXTILENE

TWI-FLEX and TWI-WAX

Treated to reduce wicking and prevent leaching, lightly waxed Textilene Twi-Flex and heavily waxed Textilene Twi-Wax provide effective resistance to moisture. Both fillers are extensively employed for non-metallic sheathed cable (building wire), maritime shipboard cable, varnished cambric cable, and underground service entrance cable.

Twitchell's superior Textilene line also includes: Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all portable and flexible cords. Fungus-resistant filler — *Twi-Tar.* Used for buried communications cable, expanded ACSR cable, and in other applications.

*Patent Applied For

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Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation—also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

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Specialists in formulating and producing lacquers for the insulated wire industry, NELCO has analyzed and solved just about every conceivable application problem.

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With the NELCO data book in your file, you will have authoritative facts on a wide variety of finishes for wire and cable constructions. Write for it now, or send us information on your specific requirements.

NELCO
LACQUERS

Chemical Products Corporation
East Providence, R. I.

booklet lists at $3. Copies of the booklet and charts may be obtained from Department T, American Welding Society, 33 W. 39th St., New York 18, N. Y.

New Catalog on Grinding and Lapping Machines

Norton Company has published a revised catalog of its precision grinding and lapping machines. This catalog includes details on the recently announced Type S-3 6 x 18" hydraulic surface grinder, the No. 2 Unitized Transfer Type Crankpin Grinder and the Type CC-8 Crank-O-Matic Semiautomatic Crankpin Grinder.

★ ★ ★

This general catalog describes the general features of Norton cylindrical, roll, angular, multiwheel, cam, universal, tool and cutter and special purposes grinding machines and the precision lapping machines. Catalog numbers for specific machines are listed for ease in requesting additional information.

★ ★ ★

For a free copy, write to Norton Company, Publicity Department, Worcester 6, Mass.

Proceedings

(*Continued from page* 83)

questioner was told they switch from series to parallel as the low heat was insufficient to keep the oven up to temperature and the high heat was more than needed. The heat is supplied by a nichrome wire coil. Burnouts do occur, and were particularly noticeable when they shut down for week-ends, but now with 7-day operation, the burnouts have decreased remarkably. Trouble results from the alternate cooling and heating of the elements.

★ ★ ★

The applicator drive, he stated, is usually through a motor with a variable speed transmission. Roller speeds are low—15 to 40 rpm, or so, which is slower than

the wire speed.

★ ★ ★

An inquiry as to relationship between the depth of the groove in the roller and the wire diameter drew the response that a 2-mil depth groove was used for 44-gage wire, although this groove would accommodate around 4 sizes of wire.

★ ★ ★

The tube's wall thickness, he stated, was not important as a heat reservoir. Actually it was only about 0.035 inches thick. The tube gets to 90% of full temperature 6 inches from the end and to full temperature 12 inches from the end. It has a sharp curve up to a level or peak spot, then tapers off for 24 or 30 inches. The hot air does not contact the tube until it is 6 inches from the end. The stub that sticks out through the front of the oven has 2 plates of 3/16th inches, which carry the heat from the heating chamber out toward the end of the tube. If the temperature of the tube is below a certain value, there will be a condensate that will carbonize, but there is no carbon formation in these tubes since high temperatures are continuously maintained.

Continuous Patenting, Cleaning and Coating Of Steel Rods

(*Continued from page* 70)

The Research Department has investigated the weight loss of material cleaned by the two methods. Results indicate that both methods will clean properly, but that acid cleaning will remove 0.1% of the base metal. Projecting that figure into our production rate, it means that one hundred fifty pounds of steel are saved each day by the mechanical cleaning.

★ ★ ★

Preliminary figures reveal that the mechanical descaling is more expensive than the acid cleaning, but this is partially offset by the saving of steel plus a potential market for the used shot and scale.

Insure safe delivery of your cable with

NYECO
Steel Shipping Reels

100 TON SUBMARINE CABLE REEL
Designed and fabricated for the OKONITE CO., Passaic, N. J.

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Send specifications for STEEL SHIPPING REELS, IMPREGNATING REELS, PROCESSING REELS, SUBMARINE CABLE REELS AND BRIDGE REELS. Prompt deliveries on large or small orders.

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- Impregnating Tanks
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- Vulcanizers
- Cabling Machines
- Pressure Vessels

ANY QUANTITY — ANY SIZE — ANY LOAD FLANGE DIAMETER from 36" up

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- Fabricated Metal Products
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- Machinery (except electrical)
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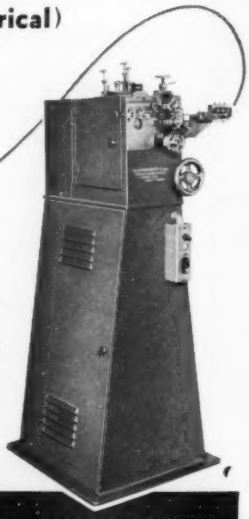
Quality and dependable service during 47 years of Sleeper & Hartley production have given the customer satisfaction for which we constantly strive.



No. 0 UNIVERSAL SPRING COILER, ESCAPEMENT TYPE. Series 720 — 73" Model.

This newest, versatile machine in the exclusive S&H escapement line incorporates the most advanced design engineering in the field, to give greater wire feed range and high speed production. Its many features include extremely accurate wire feed and controls for fine precision adjustment. Inertia is minimized since the only thing that starts and stops with this type feed mechanism is the wire itself.

Write for latest information . . .

SLEEPER & HARTLEY, INC., BOX 1249, WORCESTER 1, MASS., U.S.A.

Before arriving at the final decision to proceed with the installation of the Wheelabrator machine, an extensive research program was conducted to determine the overall effect of mechanical cleaned wire on the drawability and physical properties of the finished wire. Several different type units have been tried but with little success at our high speeds. Generally these machines bend the rod over sheaves attempting to crack the scale from the rod in several planes and follow that by brushing off the loose material.

★ ★ ★

A trial model of the Wheelabrator was installed in conjunction with a rod patenting furnace to clean a single rod. Various sizes of shot and grit were tried. The grit was recommended because it would remove the lead, but the loss was quite extensive. Shot was tried later and proved to be as good, without experiencing a heavy loss. Since the shot has a long wear life, this new unit is charged with round shot of grade S-110.

★ ★ ★

Physical tests indicate that the tensile and torsional properties of the high carbon wire drawn from Wheelabrator cleaned rods are similar to those of finish wire drawn from acid cleaned rods. Fatigue tests were conducted with the result that they too were similar to the acid cleaned rods.

★ ★ ★

A study was made to determine if the amount of shot blasting effected the physical properties. The amount of shot blasting was varied by changing the rod speed through the unit. The tensile, elongation, reduction of cross sectional area, and the Rockwell hardness test were similar in all cases. Each sample was drawn several holes, but no difference was experienced.

★ ★ ★

All the material was drawn on standard machines using standard drafting practices, and differences between the acid and mechanical cleaned material were not noticeable. Several different heats were tried during these tests to cancel out any error. Bright hard drawn wire was cleaned in the Wheela-

brator to determine if the unit could be used in a galvanizing line. Wrap tests on 1X, 2X and 4X diameter mandrels and Preece tests indicated that the cold drawn wire can be cleaned satisfactorily for successful galvanizing.

★ ★ ★

Although the surface of the Wheelabrator cleaned rods differs quite markedly from acid cleaned rods, there doesn't seem to be any difference in the physical tests. The rod surface looks rather rough with a myriad of small bumps over the surface.

★ ★ ★

Wearing of the machine parts is one thing that has to be expected. The wheel parts will last about a thousand hours. The steel "long life" liners will last about four thousand hours. With this, plus the other small parts that may break or wear out, an inventory of spare parts should be on hand for efficient operation with little down time. An hour meter is connected in with wheel motor to measure the operating time and give the Maintenance Department better control over scheduling the necessary repairs.

★ ★ ★

Although the continuous patenting, cleaning and coating line has only been in operation for a few months, indications are that a definite savings will be realized with the operation of this line. The cleaning costs and reduction of manpower will in itself reduce the cost by one-half. Our brief experience reveals that mechanical cleaning has come of age, and there is a real place for it in the wire mill of today. Our present unit is a pilot model, and, no doubt as time goes on, the inferior features of this line will be revealed and modifications will have to be made; but the advantages are very real. This doesn't mean to imply that the acid cleaning will be completely eliminated, but there are many instances where it can be. We are very optimistic about its economy and efficiency, and it is probable that the installations of other similar units will follow.

EFFICIENT, MODERN SYSTEMS

FOR

ELECTRICAL WIRE & CABLE MANUFACTURING

• *CABLE LACQUERING SYSTEMS*

Conventional cellulosic, or other type, lacquers are applied in successive continuous coats from one to twenty-eight coats over fibrous braid wrapped primary conductors. One end, four ends, or eight ends of wire are handled continuously. System includes letoff, application, drying and constant tension takeup equipment.

• *WIRE ENAMELING SYSTEMS*

Natural and synthetic enamels, silicones, solution nylon, modified plastisol, and similar insulating coatings are applied to bare, cotton or glass covered wire in round, square or rectangular cross section. Ten or twenty simultaneous strands are handled. Systems are complete with letoff, preannealer, application system, capstan and multiple takeup unit.

• *ASBESTOS INSULATING SYSTEMS*

Carded asbestos is applied to continuous single conductor as an integrated operation with saturating, rotary forming, drying, cooling and polishing of the finished wire. Wire from No. 20 gauge to No. 6 AWG is handled through an asbestos wall thickness range of from .008″ to .040″ thickness in a single pass.

• *RUBBER OR PLASTIC JACKETING SYSTEMS*

Rubber and thermoplastic jacketing compounds are continuously applied to electrical wire or cable by the extrusion method. High speed, constant tension letoff and takeup equipment, controlled cooling or continuous vulcanizing equipment are powered by synchronized range drives as complete, integrated wire handling systems. Extrusion machines of customer's choice are furnished.

• *GLASS & VARNISH COATING SYSTEMS*

Double layer of glass or cotton wrapping is applied to round, flat or square conductor. Two individual coatings of high temperature varnish are applied and the finish baked in a continuous operation. Units are complete from letoffs to takeup frames.

• *SELF TRAVERSING REEL CORD DRYERS*

These ingenious machines are used to remove hygroscopic moisture from fibers, braided or knitted flexible cable. These machines increase extrusion speeds, reduce blister scrap loss and improve diameter control. They are easily installed in existing extrusion line.

TECHNICAL INFORMATION ON ANY OF THESE PROCESSES UPON REQUEST

C. A. LITZLER CO., INC.

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Outstanding Personalities of the Wire Industry

Acrometal Products Appoints Western Representative

Fred J. Bieber, President of **Acrometal Products Co.,** Minneapolis, Minn., has announced the appointment of the **Paul I. Kenner Co.,** 230 Shaw Road, South San Francisco, Calif., as western representative for Acrometal's line of spools, reels, and special wire processing machinery.

★ ★ ★

President of the Kenner Company is **Paul I. Kenner** who has been associated with various phases of the wire industry for the past twenty years. He will have personal supervision of Acrometal's marketing in an area west to the coast from a vertical line drawn through Denver, Colorado, and including the Province of British Columbia, Canada.

★ ★ ★

The appointment is another step in the steady expansion of service to wire mills by Acrometal who has pioneered many new processes and special equipment to solve wire packaging problems.

★ ★ ★

Paul I. Kenner

Acrometal Products has recently been especially active in the development of non-returnable reels, and the designing and construction of special equipment for processing and handling large packages of fine wire.

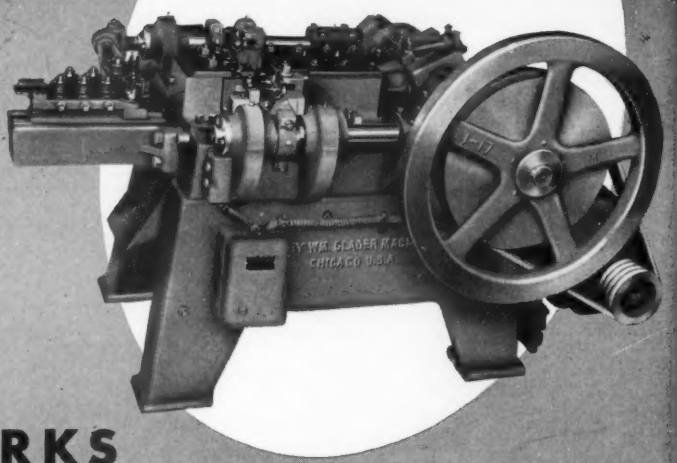
Heads Rome Cable's Pittsburgh Office

Richard T. Edwards has been named manager of **Rome Cable Corporation's** Pittsburgh district sales office, according to **Glenn E. Rolston,** vice president in charge of marketing for the firm. He succeeds **Richard A. Gray,** who is retiring.

★ ★ ★

Mr. Edwards joined the company in 1939 after graduating from high school. He served in the U. S. Marine Corps from 1942 until 1945. Following his discharge, he attended Union College, and

high efficiency—low cost
with GLADER wire nail machines



Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.

WM. GLADER
MACHINE WORKS

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Export Dept., 122 East 42nd Street, New York 17, N. Y.

graduated with a B.S. degree in mathematics in 1949. He rejoined Rome Cable and, after finishing the firm's sales training program, was assigned to the Birmingham, Alabama territory in 1950. He transferred to Richmond, Virginia in 1952 and to Pittsburgh in 1956.

Two Kaiser Men Promoted

J. S. Urbanik has been appointed manager of plant operations for the Electrical Conductor Division of **Kaiser Aluminum & Chemical Corporation** at Newark, Ohio, according to an announcement by **J. T. Dugall,** division general manager.

★ ★ ★

Succeeding Mr. Urbanik as manager of Kaiser Aluminum's Newark plant is **W. E. Linne,** formerly assistant to the plant manager there. The division operates large production plants at Newark and Bristol, R. I.

★ ★ ★

Mr. Urbanik, a veteran of 25 years in the wire and cable business, joined Kaiser Aluminum at Newark in 1950 as plant superintendent. Prior to that he had served with the General Cable Corporation for ten years in a number of plant management positions.

★ ★ ★

Mr. Linne has been with Kaiser Aluminum since 1955. Before that he had held numerous production jobs with the Wisconsin Steel Division of International Harvester Company from 1931, including that of general superintendent of the finishing mill.

J. S. Urbanik W. Linne

John Rigby to Give Mordica Memorial Lecture Next October

While the invitation to John Rigby to deliver the 1959 Mordica Memorial Lecture at the Annual Convention of **The Wire Association** in Cleveland was announced at Atlantic City, formal acceptance now has been received, we are happy to report.

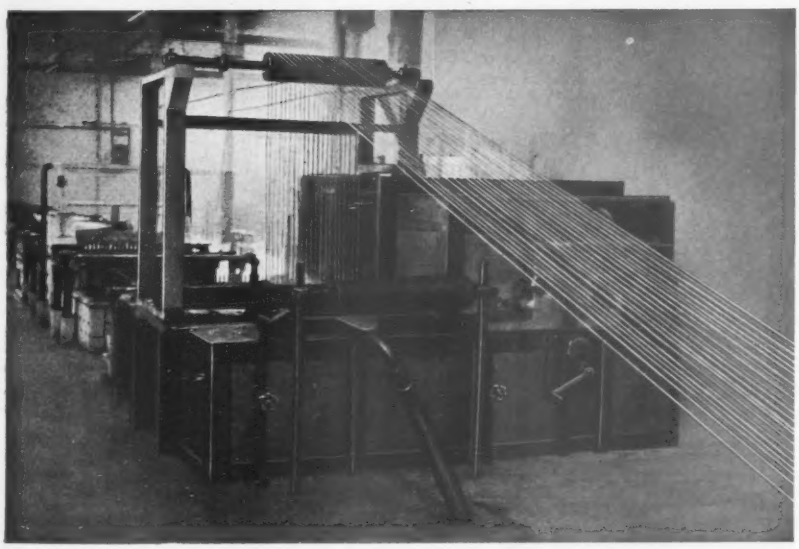
★ ★ ★

This invitation is the highest honor within the power of the Board of Directors to bestow upon a member of the Association and the person to whom it is extended is one who has contributed to the advancement of the wire industry in an outstanding manner.

★ ★ ★

Mr. Rigby is Managing Director of **John Rigby & Sons Limited,** Low Moor, Bradford, England. The choice of the lecturer is made each year by the Board of Past Presidents.

CERAMIC TANKS ARE MAKING HEADWAY!



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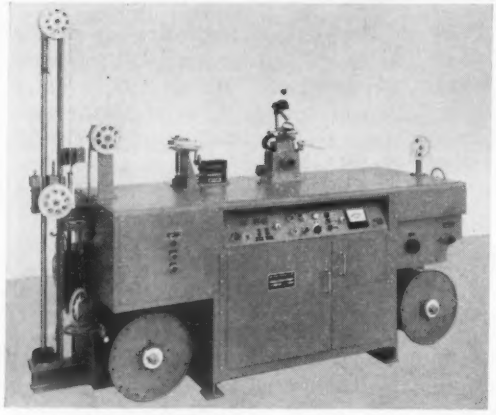

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FEATURES:

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- Plug-in control relays, rectifiers, capacitors, etc.
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Whether you can use standard machines, or need special, custom-designed equipments to perform exacting tasks, you will find we can fill most requirements. Tell us your problem. No obligation, of course.

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- PATCHING PRESSES
- SPIRAL STRIPPING MACHINES
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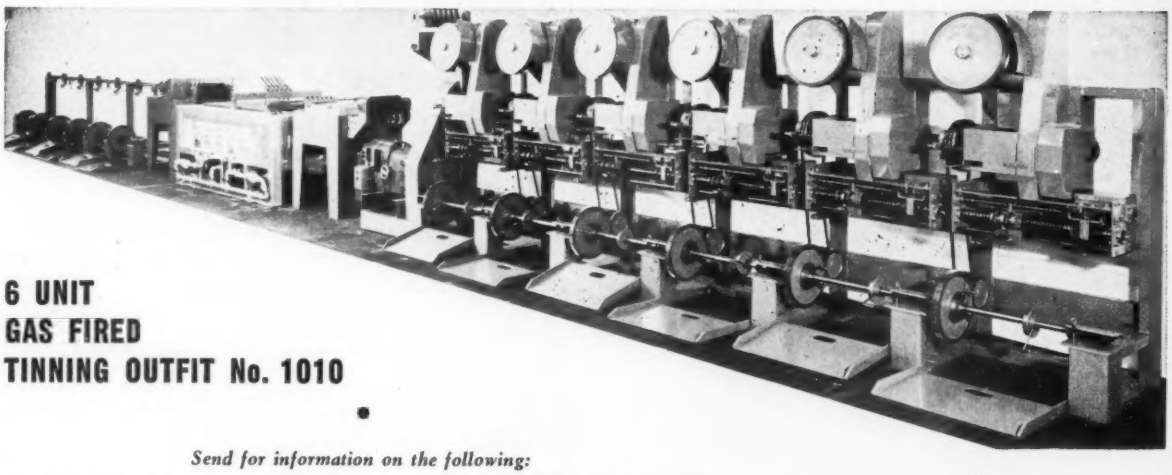

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Send for information on the following:

WIRE ANNEALING, TINNING and GALVANIZING OUTFITS

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FINE WIRE DRAWING MACHINES

MAGNET WIRE ENAMELING EQUIPMENT, INCLUDING

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COTTON, GLASS-FIBRE and TAPE COVERING MACHINES

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"American" AIM INSULATING MACHINERY COMPANY

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Earle Glen Becomes Carbide Die Distributor

The resignation of **Earle A. Glen** from the **Metallurgical Products Department of General Electric Company,** Detroit, has been announced by General Manager **Kenneth R. Beardslee.** Mr. Glen leaves his position as die sales manager to go into business as a distributor of standard and special Carboloy draw dies in Pittsburgh.

★ ★ ★

Mr. Beardslee said Mr. Glen also has bought the service shop at 704 Second Avenue, formerly owned and operated by the Metallurgical Products Department. The distributorship will be called **Glen Carbide, Inc.**

★ ★ ★

Mr. Glen has spent 30 years with General Electric, playing a major part in the advancement and acceptance of carbide dies in the wire drawing industry. Through most of those years he has traveled the nation giving talks and writing on the advantages of such dies, acting as a consultant wherever needed. He went about the country for five years during the early and mid-Thirties, setting up in wire mill changeovers from steel dies to carbide dies. His single work was to direct the original installation of the latter dies. For two years during World War II he served on an ordnance committee working on development of steel cartridge cases.

Earle A. Glen

★ ★ ★

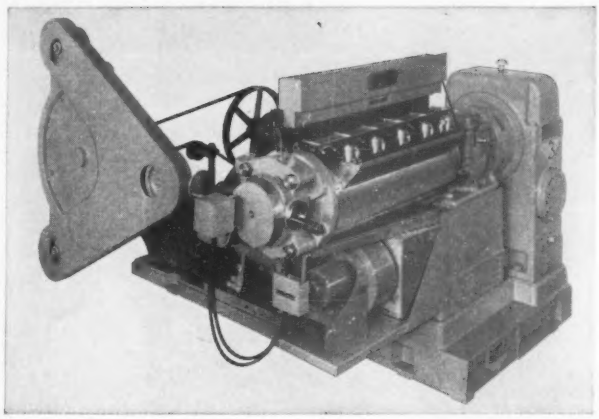
Die sales manager of the G-E department since 1944, he now opens his own company — **Glen Carbide, Inc.**—in Pittsburgh to become an authorized Carboloy die distributor, stocking standard and draw dies and fabricating special draw dies, heading and extrusion dies.

★ ★ ★

An active member of The Wire Association—he hasn't missed an annual meeting since he joined in 1936—Earle Glen was chairman of the 1954 convention in Detroit. He is a past chairman of the Association's ferrous division. Some 25 technical articles have been written about him, several of them appearing in **Wire and Wire Products.**

★ ★ ★

Many of his talks around the country have been for the American Society of Carbide Engineers and the American Society of Tool Engineers.



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"**Progress** in this work never seems apparent to me until I step back a few paces and look at the field over a 30-year period," he said. "Then I see not only progress, but the realization of our goals."

Surface Names New Purchasing Agent

Henry M. Heyn, President, announces the appointment of **Clyde E. Rosene** as Purchasing Agent of the Industrial Division of **Surface Combustion Corporation,** Toledo, Ohio. This promotion follows the retirement of **Morris Goodman.**

★ ★ ★

Mr. Rosene joined the company 25 years ago and has been Assistant Purchasing Agent since 1943.

Milford River Promotes Gordon

R. M. Gordon, formerly General Sales Manager of **The Milford Rivet & Machine Company** has been named Vice-President—Sales. This announcement was made by **V. L. Bradford.** Mr. Gordon will continue to be located at the Home Office in Milford, Conn.

★ ★ ★

Milford Rivet has five plants with its main offices in Milford. The other manufacturing divisions are located in Hatboro, Pa. Elyria, Ohio; Aurora, Ill.; and Norwalk, Calif. The Milford Rivet & Machine Company is a leading manufacturer of rivets, cold headed specialties and rivet setting equipment.

Driver Names General Superintendent

The Wilbur B. Driver Company, Newark, New Jersey, melters and manufacturers of precision alloys for electronic, electrical mechanical and chemical applications, announces the promotion of **Adam J. Alt** to General Superintendent.

Adam J. Alt

★ ★ ★

Mr. Alt came to the Wilbur B. Driver Company in 1935 as Office Boy and advanced steadily during his 23 years with the company. He has been an Executive Secretary, Paymaster, Assistant to the Sales Manager, and since 1946, Director of Production Control. During World War II, Mr. Alt served 5 years in the U. S. Army, 2 years of this time in Iran.

Inso Appoints Sales Engineer

Hector H. Heyden has been named sales engineer of **Inso Products, Ltd.,** a wholly owned subsidiary of Adam Consolidated Industries, **Harold N. Leitman,** Adam's president, has announced.

Far greater production in less space with lower cost equipment . . . for all steel and non-ferrous wire.
The fastest, most uniform way to heat treat wire* is often far lowest in cost!
AJAX
HULTGREN
electric SALT BATH furnaces
* Write for case history bulletins on Ajax Electric Salt Baths for
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Inso manufactures fused-film Teflon wire and cable for use in the electronics, missile and allied fields.

★ ★ ★

According to **Jerome I. Cohn,** Inso's general manager, Mr. Heyden will be in charge of customer relations in his new post. Mr. Heyden, who has a varied background in wire and cable engineering and its application in the missile programs, will consult government agencies and prime contractors on high-temperature wire and cable applications.

Henry Hurd Rennell

Henry Hurd Rennell, Secretary-Treasurer of the **C. O. Jelliff Manufacturing Company,** Southport, Conn., died on November 9, 1958, in a plane disaster. He was enroute from Lisbon, Portugal, to Mallorca Island on a vacation trip when the plane went down. No trace of the plane or its occupants was ever found.

★ ★ ★

Mr. Rennell had joined the Jelliff organization, wire manufacturers, in 1916 and rose to become General Manager, which post he vacated in 1951, when he was made Secretary-Treasurer of the company.

★ ★ ★

A memorial service was held in Southport for him. The regrets and sympathy of the wire industry are extended to his former associates.

Leavenworth P. Sperry

Leavenworth P. Sperry, 75, who retired on October 1, 1958, as Chairman of the Board of **The Scovill Manufacturing Company,** Waterbury, Conn., died on November 22, 1958. He had been identified with the firm for over 50 years, serving in several executive capacities, including that of president for 11 years, and becoming board chairman in 1955.

★ ★ ★

He was a graduate of Yale University and of Massachusetts Institute of Technology. Besides his Scovill interests, he was a director of a number of other companies.

Laurence Atkinson

Laurence Atkinson, President of **Frost Steel and Wire Co. Ltd.,** Hamilton, Ontario, Canada, died on December 12, 1958.

★ ★ ★

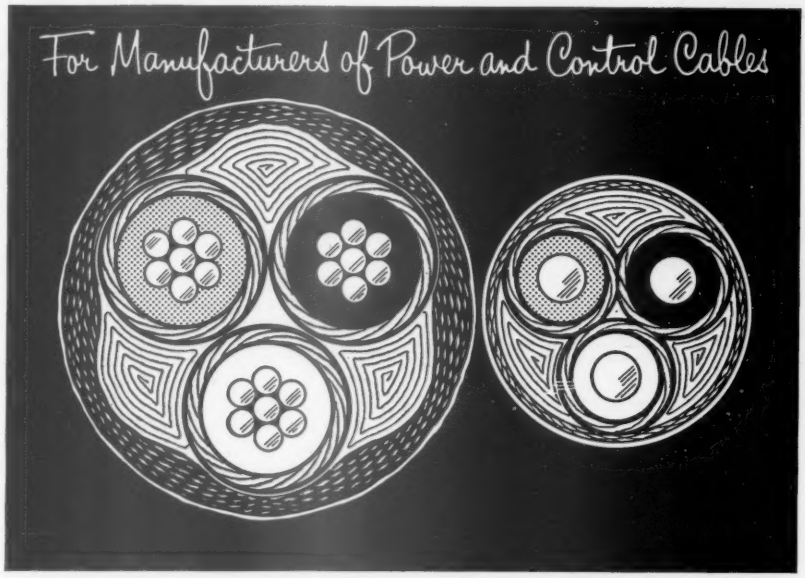
He was born in Barrow-in-Furness, England, in 1904 and came to Hamilton with the family in 1913. He attended the public and technical schools there and in 1918 joined the company as an office boy, eventually rising to become its chief executive.

★ ★ ★

Mr. Atkinson became a member of The Wire Association in 1935, at which time he was Superintendent of Frost Steel and Wire, and had been a member continuously for the past twenty-three years.

★ ★ ★

Allan B. Dove, President of the Association, attended the funeral services on December 13 at the Ryerson United Church, of which Mr. Atkinson was a member of the Board of Stewards.



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PLYMKRAFT DIVISION

PLYMOUTH CORDAGE COMPANY

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.
Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,858,858, METHOD OF SECURING WIRES TOGETHER, patented November 4, 1958 by Edwin W. Krueger, River Forest, Ill.

A method of securing a smaller wire to a larger wire is disclosed, comprising swaging the larger wire to provide a recess having shoulders adapted to support the smaller wire away from the bottom of the recess before locking, placing a portion of the smaller wire within the recess and upon the shoulders, and crimping the sides of the recess against the smaller wire to hold it against the shoulders and to distort that portion of the smaller wire lying between the shoulders and force it against the bottom of the recess.

★ ★ ★

No. 2,859,149, MANUFACTURE OF WATCH SPRINGS UTILIZING WIRE CONVERTED INTO STRIP, patented November 4, 1958 by Reinhard Straumann, Waldenburg, Switzerland.

There are 16 claims in this patent. Quenched wire is reduced in cross section and, after decreasing the cross-section, rolled to produce a flat strip, the total decrease in cross-sectional area by rolling and drawing exceeding 80% and the decrease in cross section by drawing being a major part of the 80% decrease, the drawing and rolling being for orienting the direction of the maximum value of the modulus of elasticity essentially in a direction parallel to the direction of rolling, and finally precipitation hardening the strip at a temperature of from 200° to 600° C. to give it a modulus of elasticity of at least 21,000 kg./mm.^{2}

★ ★ ★

Reissue No. 24,560, WIRE PACKAGE, patented November 11, 1958 by Oscar O. Moulden, Duncan, Okla.

A package for wire or other elongated flexible material comprising a box having a base with upwardly extended side and end walls and having a circular opening in one of the side walls and openings in the side walls and positioned at the corners of the box, and a spool having a drum with flanges at the ends freely mounted in the box and having finger receiving openings positioned in registered relation with the circular opening in the side of the box whereby the fingers of a hand may be inserted through the circular opening in the side wall of the box for rotating the spool.

★ ★ ★

No. 2,859,687, AUTOMATIC WIRE TYING MECHANISM, patented November 11, 1958 by George B. Hill, Celina, Ohio, assignor, by mesne assignments, to Sperry Rand Corporation, New Holland, Pa., a corporation of Delaware.

A wire tie mechanism for a baler of the type in which a needle on one side of a bale case projects a loop of wire across the bale case around the rear end of a completed bale for reception in a wire twister on the other side of said bale case is disclosed. There are 16 claims.

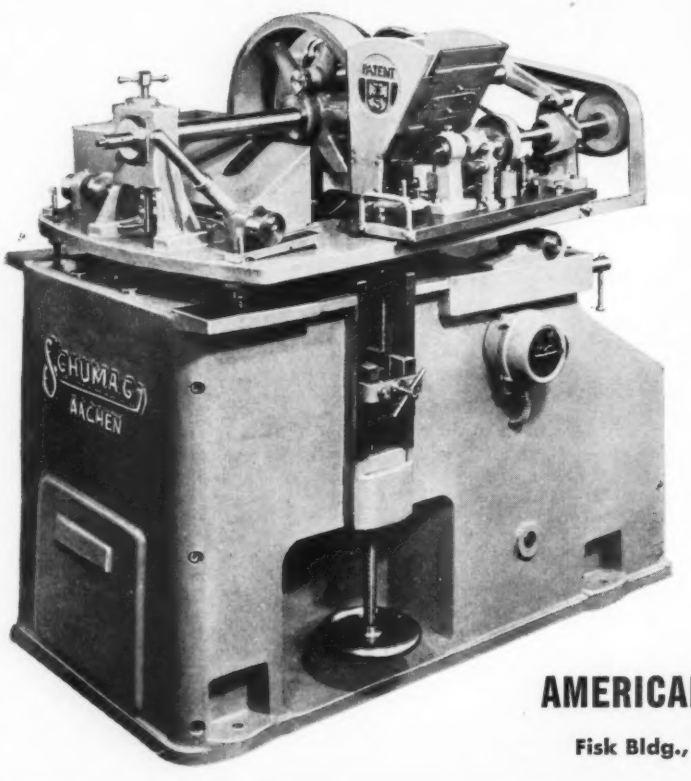
★ ★ ★

No. 2,860,670, APPARATUS FOR TWISTING WIRES, patented November 18, 1958 by Cecil C. McCain, Glen Ellyn, and George Stuhlfauth and Ben L. Wright, Chicago, Ill., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

This apparatus has first and second wire twisting stations for twisting wires of a relay part having a row of wires disposed in parallel and closely spaced relation to each other.

★ ★ ★

No. 2,860,808, WIRE CASE HAVING



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Diameters from .020" to .390"

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SHEET METAL BOTTOM, patented November 18, 1958 by Robert A. Bruce, Keosauqua, Iowa, assignor to Barker Equipment Company, Keosauqua, Iowa, a corporation of Iowa.

The sides and bottom walls of the case are of spaced-apart wires, with sheet metal slats welded to upwardly-extending offset portions of the bottom wall wires.

★ ★ ★

No. 2,861,601, COIL WINDING MACHINE, patented November 25, 1958 by Robert George Marzolf, Snyder, N. Y., assignor, by mesne assignments, to Marco Industries, Inc., Womelsdorf, Pa., a corporation of Delaware.

Associated with a rotatable turret carrying a number of collapsible coil molds distributed about the periphery of the turret, is a stationary cam for successively collapsing each of the coil moulds as the coil moulds are indexed past the cam, thereby to facilitate removal of coils wound on the coil moulds, the stationary cam being mounted on the coil winding machine at a position adjacent and spaced from the turret. Seventeen claims.

★ ★ ★

No. 2,861,621, COIL MAKING MACHINE HAVING A FLEXIBLE BELT FORMER, patented November 25, 1958 by Wilfred W. Lowther, Chicago, Ill., assignor, by mesne assignments, to United Specialties Company of Illinois, Chicago, Ill., a corporation of Delaware.

For forming thin flexible wire into a helical coil, the inventor provides a flexible tension belt of a resilient material having the general characteristics of rubber, looped partially around a mandrel and extending from it, the belt having an inner generally smooth continuous surface in engagement with the mandrel. The wire is guided between the mandrel and belt at an obtuse angle to the axis of the mandrel to form the wire into a helical coil on the mandrel.

★ ★ ★

No. 2,861,622, ANGULARLY ADJUSTABLE DEVICE FOR TRIMMING LEADING EDGE OF A COIL SPRING, patented November 25, 1958 by Alfons A. Bonde, Oak Park, and Joseph S. Di Pasquale, Elmwood Park, Ill.

The trimming device is adapted for use with a spring coiling machine which includes wire feeding means, an arbor, and a cut off device located adjacent the arbor and operating along a fixed shear plane.

Wall Chart for Steel Bars

An 11" x 17" wall chart listing all AISI grades of cold finished steel bars has been made available, free of charge, by **La Salle Steel Company.** This 5-page comparison chart lists 241 grades of steel bars which satisfy more than 95% of all current manufacturers' specifications as well as their complete chemical analysis. Machinability ratings are also given in surface feet per minute or as a percentage rating compared to AISI Grade B1112.

★ ★ ★

In addition to La Salle's Specialty Steels, the chart covers 8 AISI grades of screw machine steels, 25 AISI grades of resulphurized carbon steels, 64 AISI grades of open hearth steels, and 140 grades of alloy steels. Included in these alloy steels are 19 AISI grades which contain boron and 15 Tentative Standard Grades.

★ ★ ★

There is also a Table of Weights, which gives the weights in pounds per foot for round, square, and hexagon steel bars of thicknesses or diameters from 1/32" to 6".

★ ★ ★

Copies may be obtained without cost by writing to the Advertising Department, La Salle Steel Company, P.O. Box 6800-A, Chicago 80, Ill.

Another Development ...by Hubbard!

PLYWOOD MARRIES STEEL

FOR BETTER SHOP REELS

RESULTING IN

1 GREATER IMPACT STRENGTH

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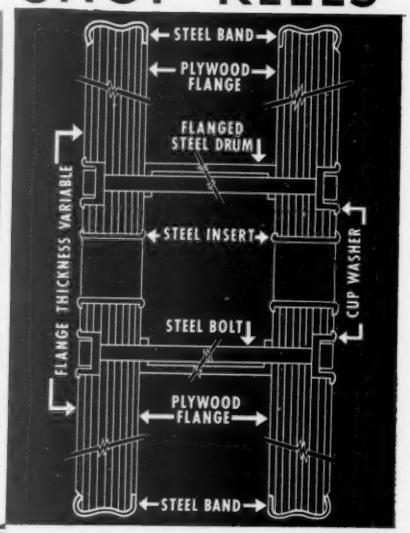
4 CAN BE SUBMERGED IN WATER

5 WIDE RANGE OF SIZES



LOWER INITIAL COST

FOR DETAILS CONTACT

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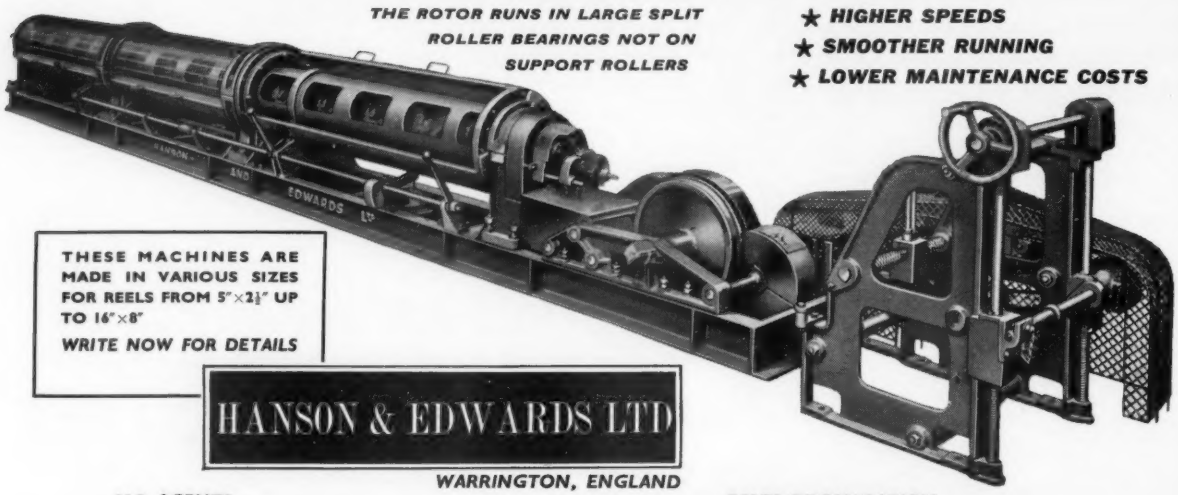
The American Pulley Company

GARRETT, INDIANA

ROLLER BEARING
TYPE TUBULAR
STRANDING MACHINE
(EITHER SINGLE OR DOUBLE CAPSTAN)

THE ROTOR RUNS IN LARGE SPLIT ROLLER BEARINGS NOT ON SUPPORT ROLLERS

★ *HIGHER SPEEDS*
★ *SMOOTHER RUNNING*
★ *LOWER MAINTENANCE COSTS*



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U. S. PATENT #2823180 AND FOREIGN PATENTS PENDING

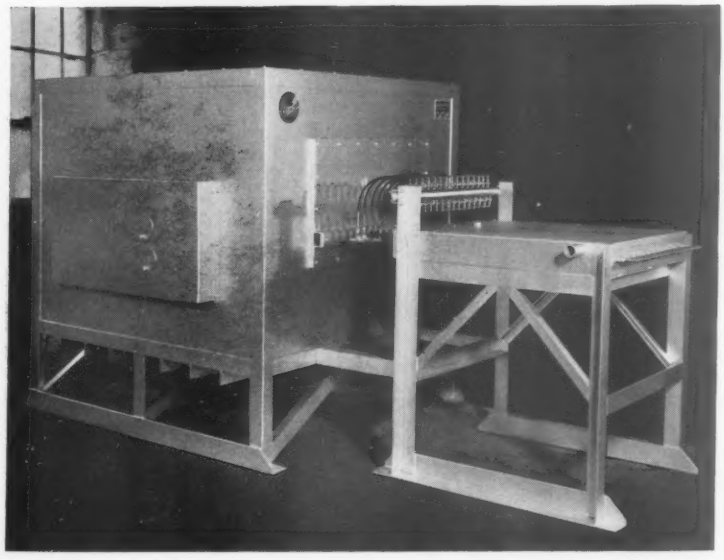
COPPER - Consumption of refined copper in the United States, August-September 1958, in short tons

	Wire mills 1/	Brass mills 2/	Chemical plants	Secondary copper smelters	Foundries and miscellaneous	Total
August:						
Cathodes	156	6,883	(3)	50	(3)	7,089
Wire bars	68,601	3,370	(3)	-----	(3)	71,971
Ingots and ingot bars	769	6,543	(3)	200	(3)	7,512
Cakes and slabs	-----	11,069	(3)	-----	(3)	11,069
Billets	-----	14,351	(3)	-----	(3)	14,351
Other	94	-----	(3)	30	(3)	124
Total	69,620	42,216	(4)	280	(4)	4/115,116
September:						
Cathodes	298	7,642	(3)	24	(3)	7,964
Wire bars	65,739	4,056	(3)	-----	(3)	69,795
Ingots and ingot bars	1,520	7,354	(3)	120	(3)	8,994
Cakes and slabs	-----	10,444	(3)	-----	(3)	10,444
Billets	-----	13,360	(3)	-----	(3)	13,360
Other	101	-----	(3)	30	(3)	131
Total	67,658	42,856	(4)	174	(4)	4/113,688

1/ Includes all wire mills with rod-rolling facilities. 2/ Includes all brass mills using copper in refinery shapes; some have rod-rolling facilities. 3/ Not available. 4/ Consumption by chemical plants, foundries, and miscellaneous plants not included. Estimate of 3,000 tons included in total.

HARPER STRAND ANNEALER

delivers bright stainless wire continuously at high speeds



Operating at temperatures from 2000°F. to 2200°F., this 30 tube Harper Electric Strand Annealing Furnace turns out Type 304SS wire bright and clean. Sizes from .02" to .0014" are passed through its 40" hot zone at rates up to 100 FPM per tube.

Providing close temperature control, Harper Strand Annealers maintain extremely dry reducing atmospheres to produce a truly bright finish. Designed for dependable, trouble-free performance over long periods, they permit wire speeds up to 150 FPM per tube.

Harper manufactures a full line of automatic conveyor, continuous tube, and bell type annealing furnaces for billets, bars, rods and wire. To solve your wire problem most profitably, call in a Harper engineer or write: Harper Electric Furnace Corporation, 42 River St., Buffalo 2, N.Y

HARPER

ELECTRIC FURNACES

ALUMINUM INGOT AND MILL PRODUCTS AND MAGNESIUM MILL PRODUCTS: SEPTEMBER 1958

(Shipments and receipts are in thousands of pounds)

Item	Number of companies reporting shipments	September 1958			August 1958* net shipments	September 1957 net shipments
		Gross[1] shipments	Receipts[2]	Net[3] shipments		
ALUMINUM PIG AND INGOT, TOTAL	88	287,508	143,872	143,636	88,316	85,897
ALUMINUM MILL PRODUCTS, TOTAL	154	253,450	22,363	231,087	213,419	216,023
Sheet and plate, non-heat-treatable	28	101,437	17,386	84,051	77,425	75,747
Sheet and plate, heat-treatable	4	(D)	(D)	17,305	15,746	17,804
Foil, including foil in lamination	14	(D)	(D)	17,956	16,838	17,720
Rolled, and continuous cast, rod and bar[4]	6	10,362	3,713	6,649	5,367	11,516
Wire, bare, conductor and nonconductor	14	4,734	206	4,528	3,450	4,392
ACSR and aluminum cable, bare	11	(D)	(D)	14,074	15,469	13,564
Wire and cable, insulated or covered	14	4,685	...	4,685	4,662	4,412
Extruded shapes, soft alloys	95	66,273	957	65,316	58,950	54,447
Extruded shapes, hard alloys	8	4,723	...	4,723	4,635	4,224
Drawn tube, soft alloys	13	(D)	(D)	4,318	3,527	3,624
Drawn tube, hard alloys						
Welded tube, non-heat-treatable	7	807	...	807	712	952
Powder and paste:						
Atomized and grained powder	3	595	...	595	616	743
Flaked powder	5	300	...	300	465	373
Paste	5	1,770	...	1,770	2,073	1,686
Forgings (including impact extrusions)	15	4,010	...	4,010	3,484	4,819
MAGNESIUM MILL PRODUCTS, TOTAL	10	(D)	(D)	1,807	1,823	1,501

*Revised.

D Withheld to avoid disclosing figures of individual companies. These figures are included, however, in the appropriate total.

[1]Gross shipments of mill products represent total shipments by producers to customers, including other producers, and shipments by producers to their own fabricating departments which manufacture products beyond the level of mill shapes. Ingot gross shipments include shipments by importers.

[2]For mill products, represents receipts from domestic producers only. In addition to receipts from domestic producers, 46,000 pounds of mill shapes were received through imports. For ingot, receipts from imports are included.

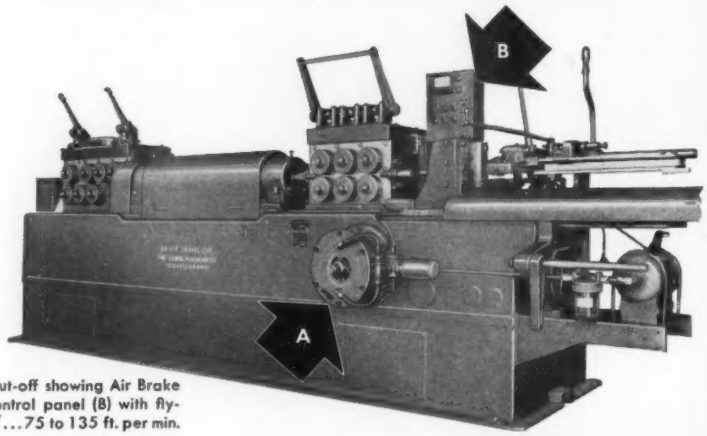
[3]For mill products, derived by subtracting the sum of producer's domestic receipts of each mill shape from the industry's gross shipments of that shape. Ingot data derived by subtracting all receipts from shipments reported.

SUPERIOR QUALITY CONTROL!

WITH LEWIS TRAVEL-CUT WIRE STRAIGHTENING AND CUTTING MACHINES EQUIPPED WITH AIR CLUTCH, AIR BRAKE AND VARIABLE SPEED DRIVE

Lewis engineers have added three important improvements to their famous Travel-Cut Wire Straightening and Cutting Machines, 1. Wichita Air Clutch, 2. Wichita Air Brake, 3. Reeves Motodrive or similar variable speed drive, for SUPERIOR QUALITY CONTROL. Assures greater accuracy and produces quality rod with a minimum of spot swell. Lewis Machines are available in 34 models to handle from .012" to ¾" dia. at speeds up to 200 FPM.

NEW BROCHURE ON REQUEST



No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake (A) (guard removed) and push-button control panel (B) with flywheel speed tachometer. Cap. ½" to ¾"...75 to 135 ft. per min.

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AMERICAN IRON AND STEEL INSTITUTE
150 EAST FORTY-SECOND STREET, NEW YORK 17, N. Y.

AIS 10

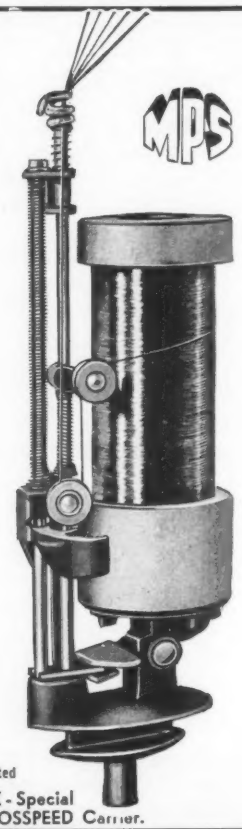
OCTOBER - 1958
Month

SHIPMENTS OF STEEL PRODUCTS
ALL GRADES INCLUDING CARBON, ALLOY AND STAINLESS
(Net Tons)

Covering Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or for Resale)

Steel Products	Items	Current Month 1958 Carbon	Alloy	Stainless	Total	Percent of Total Shipments	Prior Year (1957) Percent of Total Shipments	Year to Date * 1958 Carbon	Alloy	Stainless	Total	Percent of Total Shipments	Prior Year (1957) Percent of Total Shipments
Ingots and Steel Castings	1A	12,215	10,074	1,541	23,830	0.4	0.5	109,859	93,093	16,007	218,959	0.4	0.6
Blooms, slabs, billets, sheet bars	1B	72,483	31,697	1,155	105,335	1.7	2.0	645,898	237,117	12,968	895,983	1.8	3.0
Tube rounds	1C	910	54	3	967	-	-	6,508	1,532	52	8,092	-	0.1
Skelp	2	16,929	-	-	16,929	0.3	0.3	94,169	-	-	94,169	0.2	0.2
Wire rods	3	96,483	1,820	623	98,926	1.6	1.2	699,212	11,240	4,762	715,214	1.5	1.2
TOTAL SEMI-FINISHED		199,020	43,645	3,322	245,987	4.0	4.0	1,555,646	342,982	33,789	1,932,417	3.9	5.1
Structural shapes (heavy)	4	363,030	2,292	17	365,339	5.9	9.0	3,269,007	30,660	106	3,299,773	6.7	8.3
Steel piling	5	33,993	-	-	33,993	0.5	0.7	369,465	87	-	369,552	0.7	0.7
Plates	6	423,468	35,320	2,198	460,986	7.4	11.7	3,983,146	309,273	22,393	4,314,812	8.8	11.6
Bars—Hot rolled (incl. light shapes)	14	472,136	118,265	3,403	593,804	9.5	9.4	3,607,887	872,609	27,610	4,508,106	9.2	9.5
Bars—Reinforcing	15	183,899	-	-	183,899	3.0	2.5	1,739,394	-	-	1,739,394	3.5	3.0
Bars—Cold finished	16	83,442	14,934	4,094	102,470	1.7	1.7	665,314	110,026	34,691	810,031	1.6	1.6
Tool steel	17	838	6,379	-	7,217	0.1	0.1	6,754	50,080	-	56,834	0.1	0.1
TOTAL BARS AND TOOL STEEL		740,315	139,578	7,497	887,390	14.3	13.7	6,019,349	1,033,615	62,301	7,115,265	14.4	14.2
Wire—Drawn	23	224,088	3,680	2,322	230,090	3.7	3.2	1,901,198	26,200	18,017	1,945,415	4.0	3.2
Wire—Nails & staples	24	39,367	-	2	39,369	0.6	0.6	368,127	-	13	368,140	0.7	0.6
Wire—Barbed & twisted	25	2,732	-	-	2,732	-	-	50,910	-	-	50,910	0.1	0.1
Wire—Woven wire fence	26	9,173	-	-	9,173	0.2	0.2	144,513	-	-	144,513	0.3	0.3
Wire—Bale ties & baling wire	27	1,597	-	-	1,597	-	-	54,364	-	-	54,364	0.1	0.1
TOTAL WIRE & WIRE PRODUCTS		276,957	3,680	2,324	282,961	4.5	4.0	2,519,112	26,200	18,030	2,563,342	5.2	4.3
Sheets—Hot rolled	31	664,305	20,002	2,966	687,273	11.0	9.9	4,761,276	165,156	22,689	4,949,121	10.0	9.7
Sheets—Cold rolled	32	1,059,333	3,820	11,012	1,074,165	17.3	17.5	7,819,031	29,637	92,439	7,941,107	16.1	14.4
Sheets—Galvanized	33	290,157	-	-	290,157	4.7	3.3	2,308,463	4	-	2,308,467	4.7	3.0
Sheets—All other coated	34	20,470	-	-	20,470	0.3	0.3	141,936	-	-	141,936	0.3	0.2
Electrical sheets & strip	35	2,808	42,907	-	45,715	0.7	0.8	27,067	355,638	-	382,705	0.8	0.8
Strip—Hot rolled	36	114,602	1,617	676	116,895	1.9	1.8	797,435	13,934	6,324	817,693	1.7	1.7
Strip—Cold rolled	37	85,174	1,301	16,586	103,061	1.7	1.8	650,559	9,516	122,616	782,691	1.6	1.5
TOTAL SHEETS AND STRIP		2,236,849	69,647	31,240	2,337,736	37.6	35.4	16,505,767	573,885	244,068	17,323,720	35.2	31.3
TOTAL SHIPMENTS (1958)		5,839,861	336,758	47,921	6,224,540	100.0	xxx	46,186,117	2,645,065	394,891	49,226,073	100.0	xxx
TOTAL — PRIOR YEAR (1957)		6,119,550	381,638	49,502	6,550,690	xxx	100.0	64,550,344	4,065,490	539,697	69,155,531	xxx	100.0

* Revised



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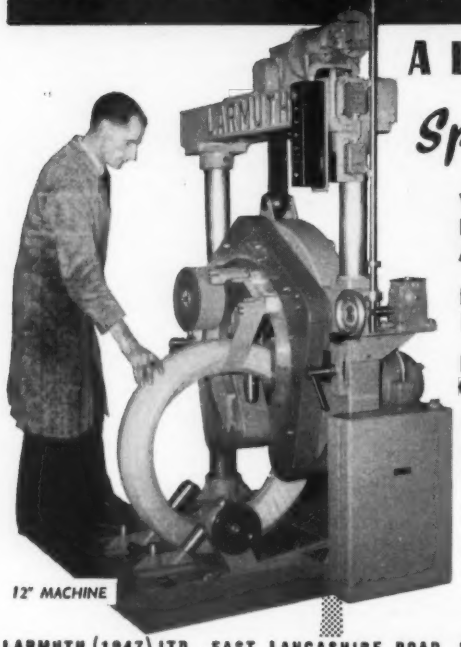

12" MACHINE

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Sales Executive Appointed by Reynolds

Appointment of **L. du Pont Yager** to direct **Reynolds Metals Company's** distributor sales operations was announced by **David P. Reynolds,** executive vice president in charge of sales. He succeeds **William F. Morrow,** who has joined Pioneer Aluminum Company in Los Angeles.

★ ★ ★

Mr. Yager, a native of Louisville, attended the University of Louisville and joined Reynolds at that city in 1929. In 1937, he was given scheduling control for all plants and transferred to sales in 1946, where he became aluminum sheet product manager. In 1948 he moved to Detroit as industrial division sales manager. Two years later he was named Great Lakes regional sales manager and in 1951 became general manager for that area. He was named vice president of Reynolds Aluminum Sales Company in 1957.

Norton Appoints Field Engineer

John W. Peterson has been appointed a field engineer at **Norton Company's** Philadelphia District Office. A native of New Britain, Connecticut, he joined Norton Company in 1954 after graduating from Dartmouth College and the Amos Tuck School of Business Administration.

Descaling of Wire by Shot Blasting—Part II

(*Continued from page 57*)

equal output the cost for shot blasting would hardly differ from that for pickling.

★ ★ ★

For further comparison the picture has been completed by showing the overall cost of pickling combined with up-to-date regeneration and neutralisation facilities, based on estimated figures as yet available from strip applications. It would appear that by a thorough regeneration of the pickling wastes and rinsing waters a rise of 25-30 pct. in the pickling

cost would be brought about. The conclusion is, therefore, that shot blasting does provide substantial cost savings over pickling plus full-degree acid recovery.

Conclusions and Outlook

From the experience and test data presented in this paper the following significant points can be deduced for practical mill application:—

(a) Blast Cleaning of Mild Steel Wires

It has been proven that the process works perfectly well on mild steel rod. In over two years of shot blasting activities where more than 70,000 tons of rod in commercial quality were descaled in this way no difficulties were met with in subsequent processing, such as drawing, regular or heavy grade zinc coating, or cold heading. Surface cleanness on the shot blasted wires was positively good.

★ ★ ★

Die wear in connection with shot cleaned wires was 10-20 pct. higher than on the equivalent wires after pickling, a drawback which is fully outweighed by the absence of metal losses characteristic of pickling. These pickling losses on mild steel rod were measured at values up to .20 pct.

★ ★ ★

From extensive checks on the mechanical properties of shot blasted wires after rod breakdown, it has appeared that the action of shot blasting has no bearing on these.

★ ★ ★

The cost of blast descaling still is, up to the present, about 15 pct. above that of normal pickling, based on the particular conditions in the works of Westfaelische Union Company, where the tonnage cleaned by blasting is only one sixth of the production in pickled wires.

★ ★ ★

It can be said, generally, that the efficacy of the shot blasting process depends largely on the composition of the scale layer, a

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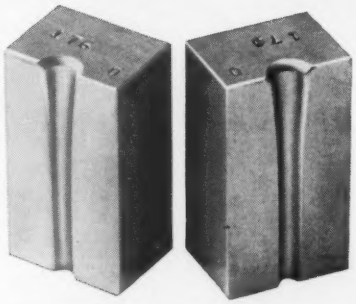

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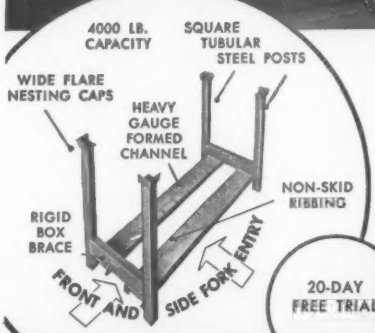

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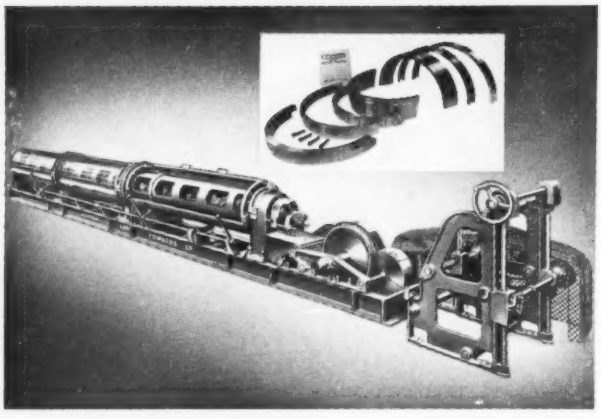

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★ ★ ★

Cut wire "Spezial" produced in our own works, .015 in. in size and having a tensile strength of 230,000 to 260,000 p.s.i., has proved a good cleaning agent and particularly economic in use.

(b) Shot Blasting of High Carbon Wires

Investigations carried out on 2 different grades of steel, with carbon contents of .68 and .79 pct. respectively, of which 20 tons each were used in testing, have yielded the following results:—

★ ★ ★

High carbon rods and wires, whether as rolled or patented, were found to descale perfectly well by means of shot blasting at normal speed. The good cleaning job achieved was quite evidently the result of the good scale conditions encountered on these wires (75 pct. FeO on the rod, 100 pct. FeO after patenting).

★ ★ ★

Similar as in the case of mild steel rod, die wear was more pronounced on the shot blasted carbon wires, along with an increased lubricant consumption in subsequent drawing. Here, the resulting higher maintenance cost on the one side compare with up to .16 pct. pickling losses, on the other.

★ ★ ★

Within the range investigated an influence of the shot blast ng treatment on the ordinary mechanical properties of the drawn carbon wires was not observed, the minor variations registered lying

within normal scatter limits.

★ ★ ★

As regards the values for fatigue limit and bending stress fatigue limit, nothing final can as yet be said on a possible effect of shot blasting on these properties, pending the completion of a number of specific tests in which these particular conditions, at present, are investigated.

★ ★ ★

It has not been possible, within the limited scope of our studies, to establish exact figures for cost comparison in respect of the high carbon wires. However, there is reason to believe that conditions will be similar to those laid down earlier for mild steel wires.

★ ★ ★

The test results discussed would appear, therefore, to admit of the conclusion that the method of shot cleaning, as it has been adopted in our works, lends itself equally for the handling of carbon wires. It is to be expected, however, that some of the conditions as they have hitherto appeared within the comparatively narrow scope of our test activities, will be subject to certain adjustments when shot blasting of high carbon wires is more widely practiced in large-scale mill applications.

★ ★ ★

In summarising this very complex subject, there is no doubt that the method of shot blasting does, in fact, provide a very effective tool in the combat for overcoming the present urgent problem of stream pollution.

★ ★ ★

As was already pointed out by my predecessor, a close cooperation is required between machine builders, shot producers and the wire mills in order to create dependable service conditions. To this I should like to add that a good deal of responsibility also rests with the rolling mill men. It is they who, by means of rolling and cooling control, must provide that type of scale which is the best for successful shot blast cleaning.

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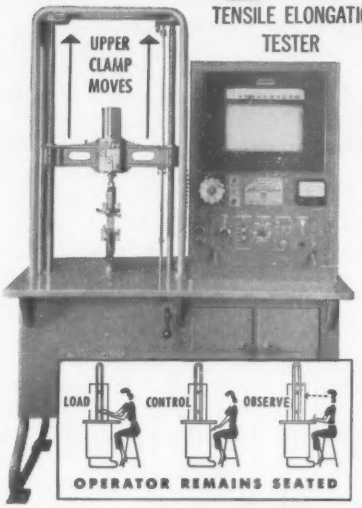

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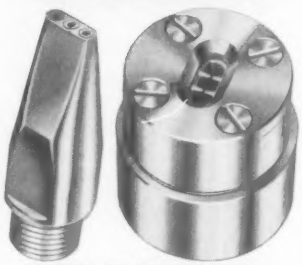

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Descaling of Wires by Shot Blasting—Part I

(*Continued from page* 48)

able to comment on the behavior of batch treated wires in subsequent processing applications.

★ ★ ★

The third method again involves shot cleaning of the rod in continuous operation, but unlike the multiple system, only a single strand is run through the machine, the shot being projected in longitudinal direction on the wire surface. A plant working on this principle has already been described by G. Dill. The process applies to wires of fairly heavy gauges; blast cleaning, lime coating and drawing with 25 to 30 pct. reduction of area are arranged in straight line operation.

★ ★ ★

To our knowledge no final judgment has as yet been established as to the value and comparative merits of the three techniques. They all have certain advantages and shortcomings, but in all probability the multiple system will prove the most economical for mills with a high production of wires in the medium size ranges, notwithstanding the fact that it constitutes an extra operation stage as compared with the one strand line described by G. Dill.

★ ★ ★

In conclusion I wish to emphasize that future progress and success in our search for improved shot blasting conditions which will provide maximum economy combined with the highest quality depend largely upon the closest cooperation between blasting machine builders, shot producers, and the wire mills.

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Continuous Patenting, Cleaning and Coating of Rod

(*Continued from page 60*)

added for better cleaning action and it will re-shape itself into round particles with use. The angular shot is more resistant to wear than the round shot.

3. **The velocity of the air through the cabinet determines the size particle which will enter the air stream for the dust collector. The shot usually starts at a particle size of .010" and diminishes in size with use to about .004" where it is picked up by the air stream. Control of the velocity determined by the blast gates in the ducts leading to the dust collector.**
4. **Any openings at the entrance or exit vestibules which may permit shot to escape must be controlled to prevent leakage of shot.**

★ ★ ★

All of these factors must be carefully watched to obtain best performance and shot consumption.

Performance

The rod coming off a line is drawn into either processed wire or finished wire rope on bobbins at speeds from 1100 to 2000 feet per minute. Die life is considered to be favorable and comparable to acid cleaned material.

★ ★ ★

In summary, the successful combination of patenting, cleaning and coating operations was possible after the development of the abrasive cleaning cabinet by Wheelabrator Corporation. Mechanical cleaning has replaced the variables of acid cleaning and in seconds removes the tightly adhering scale from the rod. The rod is completely cleaned as it emerges from the cabinet ready for coating without suffering any metal loss. At the Leschen mill we have calculated that our cost for cleaning and coating high carbon rod wire are about 10% lower than a batch acid cleaning costs supplied to us by others. The cost is based on only one half the capacity of the blast cleaning cabinet.

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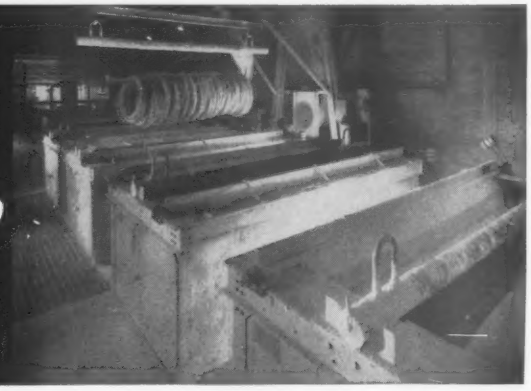

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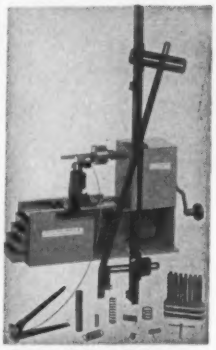

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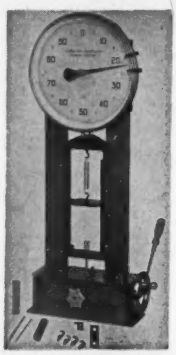

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What The Wire Ass'n Means To You—And What Is Ahead

(*Continued from page* 45)

a record-breaking outlay for research and development, which will bring into the business picture a few years from now scores of products that are not on the market at the present time. These products will require both Ferrous and Non-Ferrous wires. Severe competition greatly stimulates research, which is one of the reasons our free enterprise profit and loss system is the most productive the world has ever seen.

★ ★ ★

So-called optional income, the money left after taxes, food, clothing and shelter, payment of old debts, medical care, transportation and every thing else has been increasing steadily since 1954. Despite some inflation, consumers have more money to spend on non-essentials than ever before. The slowness in consumers' durables does not reflect lack of money, but lack of desire, which simply means that selling effort in these areas has not been nearly good enough.

★ ★ ★

In looking into the future and what will be required of the wire industry, both Ferrous and Non-Ferrous, the demand will be for very high standards of quality, not only for the wire itself, but for the various coatings and coverings, so as to meet the needs of the atomic and space age. This will require many tons of very fine quality wire with the proper insulation. I was surprised in recent months, when going through a large machine and tool builder's plant, to observe the great amount of wire used in the automatic controls. With the projection of missiles into space, we cannot gamble on quality, as the wire will be used for the automatic operation of the various units in the missile. I believe the wire industry is entering into a very broad area of the atomic energy field, of which very little so far is known. This brings us again to research. While there are many small companies in **The Wire Association** which cannot carry on

their own research, there are research organizations that are set up particularly to serve small companies, whereas the larger companies can carry on research projects in their own laboratories.

★ ★ ★

Another interesting point that we should consider is the outlook for the next ten years, examining all of the industries, businesses, etc. and the products into which wire, either or both Ferrous or Non-Ferrous, is used. The automobile industry is one of the largest consumers of wire, I believe, excepting only farm supplies. This consumption is due to the development of cold heading to replace machining so that it forces this product into the wire industry instead of into bars. This industry figures, in 1958, on building between five or more million cars; but all the data available from crystal gazers predict that production by 1965 will reach eight million passenger cars, and one million four hundred thousand commercial vehicles a year. By that time, there will be five million more people in the important 18 to 24 age group; there will be seven million more householders in the country; and eleven million more consumers ranging in the $5,000 income bracket. These data give the wire industry much food for thought.

★ ★ ★

Usage of electricity, which requires wire, has been doubling every ten years for some time; and you cannot store electricity. The multitude of devices to consume it must keep pace with the growth of the power generation. In the past ten years, electric utilities have spent thirty-two billion dollars for expansion. In the next ten years, it is estimated they will spend sixty billion more. These are really box-car figures, and I cite them only to reassure anyone who may feel fainthearted about the future economy. I am not talking about the next generation—I am talking about the next ten years.

★ ★ ★

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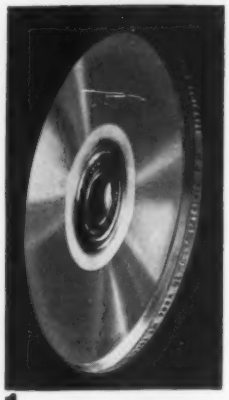

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The Annual Convention of The Wire Association

(*Continued from page 77*)

ENTERTAINMENT COMMITTEE
CHAIRMAN

Eber J. Hubbard, Pres.
Hubbard Spool Div.
American Pulley Co.
Garrett, Ind.

★ ★ ★

For the excellent work of the Program Committees under Mr. Worth's skillful guidance, the Officers and Directors of the Association are deeply grateful.

★ ★ ★

Our Convention was a success. It could only have been so provided the men responsible for it gave liberally of their time and talents. It has become increasingly evident, as one reviews the events which transpired, that our 1958 Committees did an outstandingly good job. Thank you, gentlemen!

★ ★ ★

A word of praise for the excellent handling of all arrangements for rooms, equipment, and services on the part of **Haddon Hall** is also in order. This was done with a degree of cooperation that contributed in no small measure to the smooth functioning of our many and varied events.

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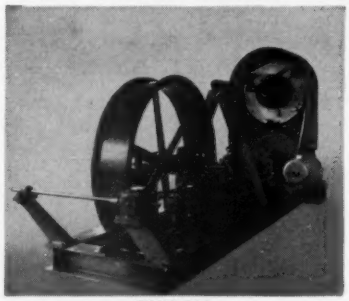

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Apex Alkali Prize Winners

Apex Alkali Products Co., Philadelphia 27, Pa., had a guessing contest during the 1958 Annual Convention in Atlantic City, in which visitors to their headquarters in Haddon Hall were invited to estimate the number of words in the literature posted on the "Apex Pyramid." The correct number was 2108.

* * *

According to Alkali Ike, those coming closest to the exact count and who therefore won the first, second and third prizes, in the order of their proximity to the right number, were:

W. C. Lovelett
John A. Roebling's Sons Corp.
Roebling, N. J.

Stewart H. Jones
Bethlehem Steel Co.
Johnstown, Pa.

R. C. Faust
National Wire Products Co.
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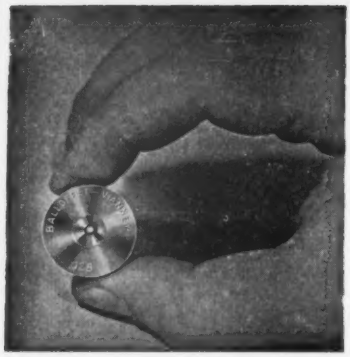

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Sylvania Dedicates Research and Development Center

About a year ago the construction of a new building at Towanda, Pa., was completed to house research and development activities of the Chemical and Metallurgical Division of the **Sylvania Electric Products, Inc.** The equipment and staffing of this Center shortly thereafter was started and having neared completion in October, 1958, dedication ceremonies were held, preceded by a showing of the new facilities and the plant there to the press.

★ ★ ★

The Center was named after John B. Merrill, former Vice President of the company, who had been instrumental in starting the Towanda plant that adjoins the Center. Mr. Merrill was killed in an air crash in 1955. **G. L. Moran,** Vice President and General Manager of the Division, acted as master of ceremonies, and **Marion E. Pettigrew,** Senior Vice President in charge of the company's Chemical and Metallurgical Division, made the dedicatory address.

★ ★ ★

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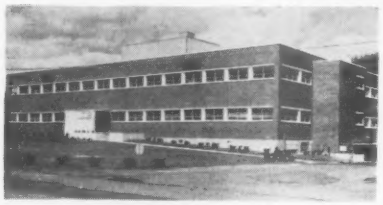
The new laboratory is engaged in research, engineering and product development, a very large portion of which is devoted to tungsten and molybdenum wire. Work on germanium and silicon semiconductors, phosphors and other chemical materials is given considerable attention, all of these products being manufactured in the plant.



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★ ★ ★

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Technical Bulletin on Cleaning Solvents

A new "safety in use" approach for evaluating the relative safety of solvents used in "cold cleaning" of metal parts is contained in a new technical report published by the **Du Pont Electrochemicals Department,** Wilmington 98, Del.

★ ★ ★

The report establishes a new concept of a relative safety index for solvent evaluation based on maximum allowable concentration, vapor pressure, and evaporation rate of the solvents. Heretofore, there has been no good basis offered for relating these factors from an over-all "safety in use" standpoint. Results are confirmed by extensive testing of the atmosphere during "cold cleaning" operations using two commonly used solvents, perchlorethylene and methyl chloroform (1, 1, 1 trichlorethane).

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W. C. Dillon & Co., 14620 Keswick St., Van Nuys, Cal., has issued an 81-page booklet entitled "Dillon Dynamometers at Work in the World."

★ ★ ★

The text, fully illustrated, covers the many applications of the company's dynamometers and includes engineering data and related facts.

★ ★ ★

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Davis Electric Co., Wallingford, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Kraft, J. A. Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A. Co., Inc., Cleveland, Ohio

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Frankfort, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH—WIRE, All Metals
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
United States Borax & Chemical Corp., Div. Pacific Coast Borax Co., New York, N. Y.

COLOR CONCENTRATES— For Wire Coatings
Blane Corporation, The, Canton, Mass.
Century Products Co., Detroit, Mich.

COMPOUNDS—Coppering
Amchem Products, Inc., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago
Rusch Wire Die Corporation, Croton-on-Hudson, N. Y.

COMPOUNDS—Extrusion, for Wire
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.

COMPOUNDS—For Improving Drawing & Extrusion
Amchem Products, Inc., Ambler, Pa.

COMPOUNDS—Metal Finishing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Phosphate Coating
Amchem Products, Inc., Ambler, Pa.

COMPOUNDS—Rust Preventing
Amchem Products, Inc., Ambler, Pa.
American Lanolin Corporation, Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS—Vinyl
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Chemical Products Corporation, East Providence, R. I.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit

CUTTING TOOLS—Wire
Robinson, M. W. Co., Rockfall, Conn.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Research Co., St. Clair Shores, Mich
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit.

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Drawing Angle Controlled
Hoosier Wire Die, Inc., Ft. Wayne, Ind.

DIES DIAMOND—Reversible
Indiana Wire Die Company, Fort Wayne, Indiana
National Wire Die Co., Inc., New York, N. Y

DIES—Extrusion
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.

Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Hillside, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tinning
Roux Wire Die Works, Inc., Oriskany, N. Y.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Hoosier Wire Die., Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Electric, Adjustable Speed
Allis, The Louis Co., Milwaukee, Wisc.

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
Amchem Products, Inc., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FREQUENCY CHANGERS—
The Louis Allis Company, Milwaukee, Wisc.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corporation, Buffalo, N. Y.
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Resistance Heating, Strand
Electric Furnace Company, Salem, Ohio
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio

FURNACES—Strand Annealing
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Company, Salem, Ohio
Harper Electric Furnace Corporation, Buffalo, N. Y.
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Sunbeam Corporation, (Industrial Furnace Division), Chicago, Ill.

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GEARMOTORS—
The Louis Allis Company, Milwaukee, Wisc.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Chemical Products Corporation, East Providence, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS —
Apex Tire & Rubber Co., Pawtucket, R. I.
Biane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
Shawinigan Resins Corporation, Springfield, Mass.
Thompson Chemical Company, Pawtucket, R. I.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

LACQUERING SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The. Philadelphia and Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Company, Harrison, N. J.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.

MACHINERY—Bobbin Winders
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Braiding
New England Butt Co., Providence, R. I., Division of Wanskuck Co.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Chain Making
Baird Machine Company, Stratford, Conn.
Larmuth and Bulmer, Limited, Manchester, England
Nilson, A. H. Machine Co., Shelton, Conn.
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Closing Rope
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Cold Heading
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden.
National Mach'y Exch (Used), New York
Steel & Wire Machinery Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Metallurgical Products Dept. of General Electric Co., Detroit
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.

Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Company, Stratford, Conn.
Nilson, A. H. Machine Co., Shelton, Conn.
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Mfg. Co., Wallingford, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia
Cook Mfg. Co., The, Paterson, N. J.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York,
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Printing on Electric Wire
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., Boyiston, Mass.

MACHINERY—Re-Spooling
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Emory Company, Robert J., Newark, N. J.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
National Mach'y Exch. (Used), New York N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spooling Tension Controls
Web Controls Corp., West Englewood, N. J.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Staple
Baird Machine Company, Stratford, Conn.
Nilson, A. H. Machine Co., Shelton, Conn.

MACHINERY—Straightening & Cutting
American Laubscher Corporation, New York 19, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Düsseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Entwistle, James L., Esmond, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Kraft, J. A., Maschinenfabrik, OLPE/Westf. Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A., Co., Inc., Cleveland, Ohio
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Mfg. Co., Wallingford, Conn.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Thread Rolling
Mettler Machine Tool, Inc., New Haven, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—Welded Wire Mesh
National Electric Welding Machines Co., Bay City, Michigan
Schlatter, Ltd., H. A., Zollikon/Zurich

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Entwistle, James L., Esmond, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.

Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York 19, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Federal Mfg. Co., Wallingford, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Wire and Machinery Co., Cleveland, Ohio
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wartenweiler, Emilio, Milan, Italy
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Wire Forming
Baird Machine Company, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Shelton, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Company, Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MOTORS—Electric, A.C. — D.C.
The Louis Allis Company, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAINT BONDING CHEMICALS—
Amchem Products, Inc., Ambler, Pa.

PAINTS—Heat Resisting
Amchem Products, Inc., Ambler, Pa.

PAPER—Creped Wrapping
Ludlow Papers, Inc., Needham Heights, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Ludlow Papers, Inc., Needham Heights, Mass.

PAPER—Insulating
Ludlow Papers, Inc., Needham Heights, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Company, Plastics Division, St. Louis, Mo.

PLASTICS—for Wire Insulation
Apex Tire & Rubber Co., Pawtucket, R. I.
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Shawinigan Resins Corporation, Springfield, Mass.
Thompson Chemical Company, Pawtucket, R. I.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation. New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

PRINTING WHEELS—for Electric Wire
Frank Daniels & Co., New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M. Co. Inc., Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Mettler Machine Tool, Inc., New Haven, Conn.
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
National Vulcanized Fibre Co.. Lestershire Spool Div., Johnson City, N. Y.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
National Vulcanized Fibre Co.. Lestershire Spool Div., Johnson City, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
National Vulcanized Fibre Co.. Lestershire Spool Div., Johnson City, N. Y.
New York Engineering Corp., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Steel, for Rope and Cable
New York Engineering Corp., Yonkers, N. Y.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Boonton Molding Company, Boonton, N. J.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
National Vulcanized Fibre Co.. Lestershire Spool Div., Johnson City, N. Y.
Nilson, A. H. Machine Co., Shelton, Conn.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Aluminum Company of America, Pittsburgh, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—Plastic
Boonton Molding Company, Boonton, N. J.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
National Vulcanized Fibre Co.. Lestershire Spool Div., Johnson City, N. Y.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

WHERE TO BUY, Continued

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Shawinigan Resins Corporation, Springfield, Mass.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila, Pa.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WAXES—for Insulated Wire
Cary Chemicals, Inc., New Brunswick, N. J.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
Micro Products Co., Chicago, Ill.
National Electric Welding Machines Co., Bay City, Michigan
H. A. Schlatter, Ltd., Zollikon-Zurich

WHEELS—for Printing on Electric Wire
Frank Daniels & Co., New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co. Inc., Boylston, Mass.

WIRE—Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Ball
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Clad and Plated
Sylvania Electric Products Inc., Warren, Pennsylvania

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Malin & Co., The, Cleveland, Ohio
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
Aluminum Company of America, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat
Montgomery Co., The, Windsor Locks, Conn.
National Standard Company, Niles, Mich.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
Aluminum Company of America, Pittsburgh, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corporation, Pressed Steel Div., Cleveland, Ohio
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Metalizing
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Worcester Wire Works Div., National-Standard Company, Worcester, Mass.

WIRE—Needle
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Sylvania Electric Products Inc., Warren, Pennsylvania
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Roebling's John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Firth Sterling, Inc., Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Porter Company, Inc., H. K., Riverside—Alloy Metal Division, Riverside, N. J.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Division, Armco Steel Corporation, Kansas City, Mo.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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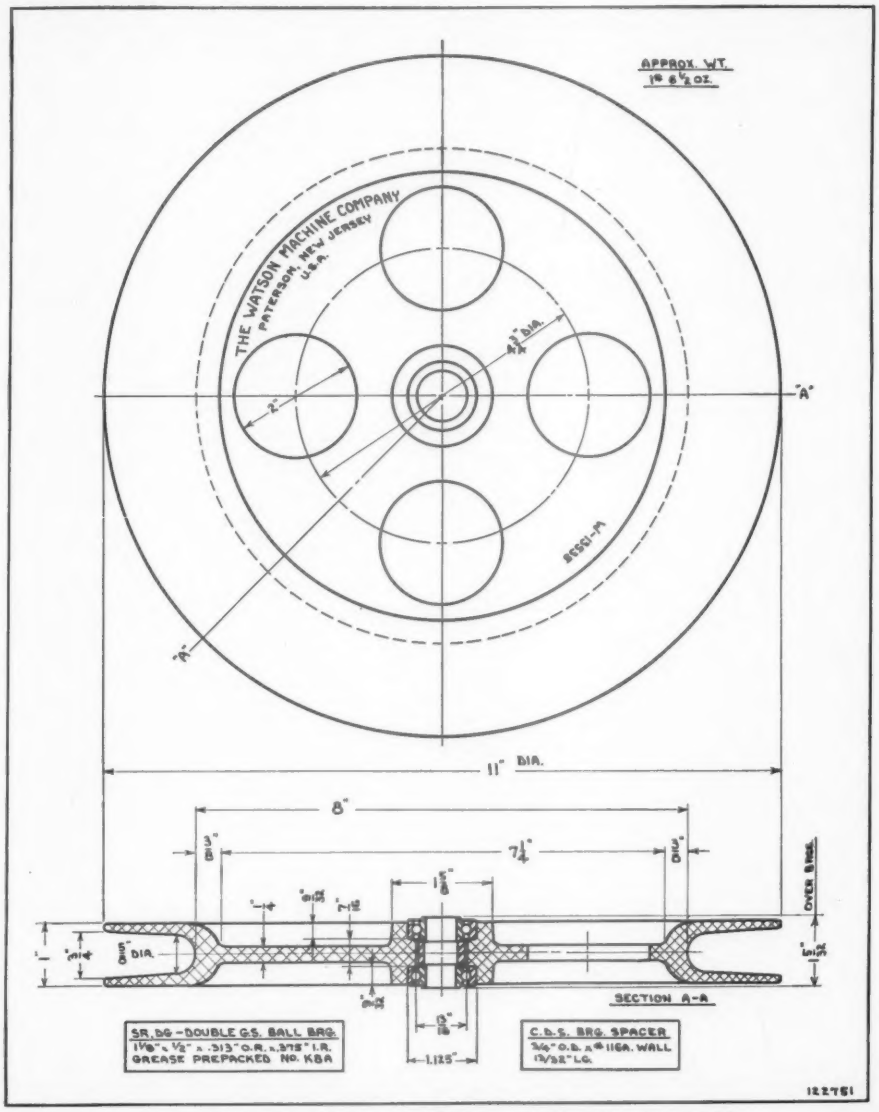
LOW COST



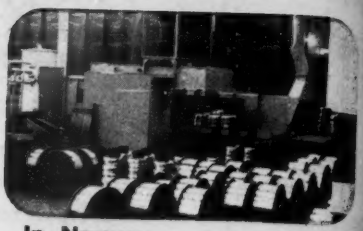
FROM STOCK

Inquiries Invited — Address "Plastics Dept."

1-59

In Denmark. An EF electrically heated bulkhead tray type continuous roller hearth furnace installation bright annealing copper wire on large reels and in coils.

In Sweden. An EF continuous roller hearth furnace installation (over 250' long) normalizing and decarburize annealing various widths of silicon steel strip.



In Norway. An EF special atmosphere tray type furnace with kerosene combustion type generator bright annealing copper wire on large reels and in coils.

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Thousands of Installations in U.S. and Other Countries Including . . .

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- BELGIUM
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Galvanizing
Glass Heat Treating
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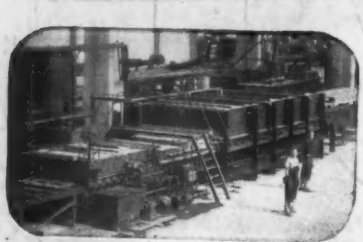
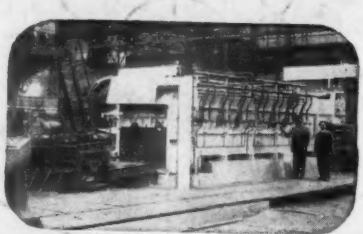
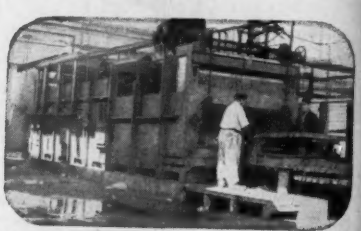
ELECTRIC AND FUEL FIRED EF FURNACES



In Chile. An electrically heated EF roller hearth furnace annealing copper and brass tubing, rods and bars, continuously. Capacity 6,000 lbs. brass per hour.

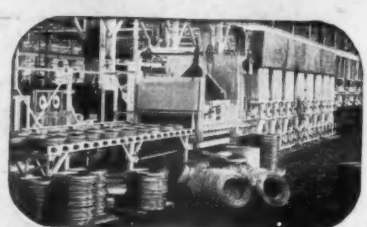


In France. An EF direct oil or gas fired continuous pusher type furnace. This furnace is used for heating large copper cakes prior to rolling.



In South America. This EF oil fired pusher type furnace in another South American plant, uniformly heats steel billets up to 60" in length to 2100° F., continuously.

In Mexico. EF direct gas fired special atmosphere forced circulation single stack circular bell steel strip annealers. Each accommodates three 48" x 40" 15,000 lb. coils (45,000 lbs.)



In Canada. Coiled and straight length tubing is uniformly bright annealed in this EF gas fired radiant tube type furnace. Capacity 6,400 lbs. tubing per hour.

In Japan. Part of an installation of large EF gas fired three-stack rectangular bell type forced circulation special atmosphere furnaces for annealing steel strip.